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A Perspective of the Oil Spray Situation

By P. J. Parrott
New York State Agricultural Experiment Station

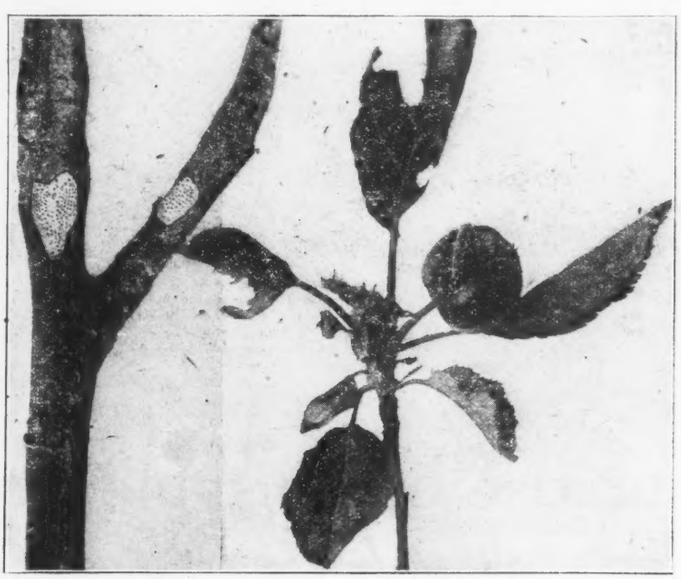
THE INTEREST in oil sprays displayed in the Atlantic Coast states is the outcome largely of the successful control of San Jose scale in the fruit areas of the Mississippi Valley by means of lubricating oil emulsion. That a spray containing only two per cent of oil should be found to possess such a high degree of efficiency was an important development. But what also has made a great appeal to our growers is the fact that the material is economical, the cost of 100 gallons of the diluted spray containing two per cent oil being approximately 77 cents. Another aspect of the problem should also be noted. The San Jose scale is relatively of little importance at the present time in New York, or, at least, it causes no great apprehension, for which reason our growers are not so much concerned with methods of combating this pest as they are desirous of securing definite information relative to the utility of oil sprays for other species of injurious insects, which for the time being, at least, are of greater importance. This is what growers are revolving in their minds. Therefore, the purpose of this article is to point out what we have learned relative to the susceptibility of various pests to this kind of treatment, as well as to indicate to orchardists desiring to use oil sprays certain precautions that should be kept in mind relative to the selection and employment of such preparations.

Susceptibility of the San Jose Scale to Lubricating Oil Emulsions

In common with other fruit districts, the lubricating oil emulsion has displayed a high rate of toxicity against this pest. In tests conducted in old, neglected apple orchards severely infested with the insect, the initial killing was considerably greater than with various sulphide sprays, and fruits from the oil-treated trees at the time of harvesting have generally shown less evidence of reddish discolorations. Contrary to experience in other fruit districts where preparations containing as high as four per cent seem necessary, the scale has been efficiently controlled with dilutions containing only two per cent oil. In old apple orchards where present spray methods are not giving satisfactory results, a late dormant application of lubricating oil emulsion containing two per cent oil for a year or two is worth serious consideration.

If control of aphis as well as the scale is desired, it is preferable to make the treatment as a delayed dormant application, as will be explained in greater detail later.

The evidence to date relative to the safeness of using lubricating oil emulsion for dormant or semi-dormant treatment is favorable. Trees sprayed for three successive seasons have so far shown no evidence of injury, but what the ultimate effect will be from repeated treatments over a period of years is a matter for the future to determine. Certain it is that trees receiving occasional treatments with stable emulsions show no obvious ill effects, so far as their health and productive capacity are concerned.



Left.—Egg clusters of the leaf roller—these are susceptible to strong oil sprays. Right.—Leaf roller caterpillar working on a young apple

Toxicity of Oil Sprays to Red Mite Eggs

The red mite is a pest which is attracting no little attention, and more growers each year desire to plan their spray program so as to insure better control of the pest. Noticeable injury occurs in all of our leading fruit growing districts, especially in unsprayed or poorly sprayed orchards. Lime-sulphur as used in the different applications mentioned in the standard spray schedule still constitutes the chief means of control, although there is a tendency for some orchardists to make at least one application with oil in the hope that the special treatment will insure greater protection to the trees than has been secured with lime-sulphur.

As far as oil preparations are concerned, the eggs of the red spider or mite are sensitive to treatment with oil sprays. Lubricating oil emulsion (three or four per cent oil) is an efficient ovicide, as are certain of the commercial miscible oils. In this connection, it is deserving to note that lime-sulphur as strong as 1 to 8, applied as a dormant or delayed dormant spray, exerts only a small influence on the eggs. Applications of this spray at the periods designated afford no guarantee of adequate protection during years favorable to the rapid multiplication of the pest. Thorough spraying of infested apple trees at the time of the pre-pink and calyx applications with 1 to 40 lime-sulphur contributes materially to the control of the red spider, and likewise all succeeding applications of this spray furnish considerable protection. During most seasons, this is about all that needs to be done to keep the red spider in check in many orchards. A special treatment with oil as the buds break is probably justified in orchards in

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XUM

Dilute Versus Standard Sprays for Apple Blotch

By F. H. Ballou and I. P. Lewis

Ohio Agricultural Experiment Station

AT THE present time, there is increasing interest among Ohio apple growers concerning mild or dilute fungicidal sprays *very thoroughly applied* — especially for the after-bloom or summer treatments— as compared with sprays of stronger or so-called "standard" formulas, applied, as they far too commonly are, in a more or less careless, imperfect manner.

The idea of dilute sprays does not deserve to be regarded as a new one. Modification of the strength of Bordeaux mixture began soon after introduction of the formula from France in 1888 or thereabouts.

The original recipe for making Bordeaux required 12 pounds of copper sulphate and 15 pounds of lime to 50 gallons of water. Obviously, trouble was experienced with that original and generous formula, for the horticultural and pathological literature issued during the succeeding 30 years indicates that the dangerously caustic properties of strong copper sprays became generally recognized. Consequently, there was a gradual lessening of the proportions of copper and lime to the commonly accepted unit of one barrel (50 gallons) of water until the somewhat indefinite term "standard Bordeaux mixture," used by different experiment stations of our country, was applied to a number of relatively mild formulas, such as 6-6-50, 5-5-50, 4-6-50, 4-5-50, 4-4-50 and 3-5-50. And yet, the more dilute of these formulas not only surprisingly maintained full efficiency of the compound as a fungicide, but those dangerously caustic properties so destructive to foliage and fruits when applied under adverse weather conditions were lacking as well.

Dilute Lime-Sulphur Spray Introduced

In the year 1910, the writer and his field assistants made the first trial (in Ohio) of the then new dilute commercial lime-sulphur spray as a fungicide, in comparison with Bordeaux mixture of the (at that time, in Ohio) so-called "standard" strength of 4-4-50 proportions of copper sulphate, lime and water. From the very beginning of this test, the new lime-sulphur spray, in orchards badly infected by apple scab, demonstrated its superior qualities; and these experiments, continuing for a full five-year period (1910-14, inclusive), served only to verify results obtained in the initial season's trial.

Many apple growers of Ohio visited and studied these orchard comparisons of Bordeaux and lime-sulphur as fungicidal sprays, with the result that the majority promptly adopted the latter and continued to use it—even up to the present time.

On the other hand, there were a few horticulturists and pathologists who were loath to believe that in the dilute lime-sulphur solution there had been developed a safe and worthy rival of Bordeaux mixture. Some of these earnest doubters could not be induced even to visit our trial orchards, where might be seen and studied the object lessons so clearly outstanding. This opposition to the lime-sulphur spray by those who firmly refused to recognize it as a fungicide, continued not only during the entire five-year period (1910-14, inclusive) of comparison of the two sprays under discussion, but for at least eight years following conclusion of this series of experiments.

Results from spraying for apple blotch with standard materials of varying strengths in 1926. The figures under the baskets represent the grade of the fruit, as follows: (1) entirely free from blotch; (2) very slightly marked (spots not over one-fourth square inch in area); (3) blemished to the extent of more than one-fourth square inch in area, but not deformed; (4) deformed or cracked by disease.

The various lots were sprayed with the following materials:

A, 3-9-50 Bordeaux
B, 2-6-50 Bordeaux
C, 1-3-50 Bordeaux
D, 3/4-2 1/4-50 Bordeaux
E, 9-50 hydrated lime
F, 1-40 lime-sulphur
G, 4-50 dry lime-sulphur
H, check plot, not sprayed

A New Series of Spraying Tests

In the winter of 1921-22, following two or three seasons in which fungous diseases in some of the apple growing sections of Ohio were reported to be increasing, discussion of the comparative merits of Bordeaux and lime-sulphur sprays attained that peak of difference and outspoken expression of opinion among those directly interested, at which it seemed advisable to plan, again, an entirely new project of spraying experiments. In the meantime, however, we had made a careful survey of the orchard areas of Ohio, in which was revealed the fact that among the users of Bordeaux mixture, as well as among those who were spraying with the lime-sulphur solution, there were those who were failing to control apple scab and other fungous troubles of the apple. But the more significant feature was the clearly evident fact that the novelty and appeal of spraying, which was once a new and rather interesting orchard operation, had so far worn off that neither the users of Bordeaux nor the users of lime-sulphur were doing as careful, thorough work in spraying as they previously had done.

The fundamental purpose, therefore, of the new spraying experiments begun in the spring of 1922, was to determine—conclusively, it was hoped—the comparative merits of standard Bordeaux mixture (3-5-50, in 1922, in Ohio), and the standard or 1¼-50 commercial lime-sulphur solution, as fungicides in prevention of diseases affecting the apple.

It was obvious that, in these new spraying tests, we would be limited, as in previous experiments of this kind, to use of *copper* and *lime* and *sulphur*, for, up to the time of beginning this more recent project in

(*Continued on page 18*)

Selection and Use of Portable Spray Outfits

By K. J. T. Ekblaw

NOT EVERYONE appreciates the variety of practical knowledge which an orchardist must possess if he really is to make a success of his work. His is an extremely technical job as well, and if every consumer who sinks his teeth into a juicy apple only stopped to realize what a tremendous lot of work and care and thought and study lay behind the production of that apple, he might think its fragrant aroma and luscious flavor were just a little bit sweeter because of it.

Fruit growing is becoming more and more complex. A host of experts are trying to make it safer and simpler as a business, and, of course, they are succeeding. But every new discovery they make, means just that much more additional information which the fruit grower has to absorb.

Among other things, a fruit grower has to be something of an engineer. He uses mechanical equipment the year round in the various phases of his work, and some of this equipment is not very elementary in its character, either. Back of its design is some high grade engineering brains, and it takes engineering brains to understand it, operate it, and care for it.

This equipment represents quite an investment, just considering the money paid for it. For this reason alone, no sensible man, who runs his orchards on a business basis, and who counts overhead expense and depreciation as real costs, is going to neglect his equipment. And then there's its potential value—its police power, so to speak, as a guardian of the product of the orchard—why, if it weren't for equipment, modern equipment as used by progressive growers, where would the product be? And where would the profits be?

Yes, indeed, the fruit grower must be an engineer. And even though people laugh at all the varieties of "engineers" which modern developments are bringing forth, still it's perfectly sane and logical to assert that the fruit grower must be a "spray engineer," for spraying is one of the important things he must understand. Spraying is largely a mechanical problem, for it is concerned with pressures and methods of obtaining them, with equipment for producing mixtures and for distributing them in the most efficient and economical manner, and so on.

Colleges Should Give Courses on Spray Equipment

Sometimes I wonder why more thorough courses in the design, use, and care of spray equipment are not taught in our agricultural colleges. Surely in every state where orcharding is practiced on any sort of a sizable scale, and that is in most of the states, the agricultural college ought to devote at least one thorough course to this subject, under the direction of someone who really knows something about it. With the millions of acres of fruit now being grown, and with the acreage constantly increasing, and with the need for efficient spraying practice likewise increasing, it certainly looks as if the subject is worthy of the most careful attention. At some schools, it is handled with a fair degree of thoroughness, but at others it is sadly neglected.

I venture to say that many a horticultural student is turned out from some of these courses with only the faintest knowledge of what constitutes good spray equipment. And as for the necessary knowledge for its careful operation—he has practically none.

Let the student, the fruit grower of the future, learn something of this equipment for which he'll soon be spending his money. Let him learn how to choose equipment, and choose wisely; how to use it, and use it properly; and how to care for it, so that its value may be safeguarded.

Factors in Selecting Equipment

What are some of the factors in the choice of adequate spray equipment? Well, to begin with, there is the kind of fruit that is raised; certain kinds of crops require special equipment. Then there is the size of the orchard; a small acreage may be covered with hand spray outfits, while large acreages will most certainly require power equipment. Then perhaps in certain localities there may be special plant pests or diseases that require special treatment and special equipment to apply it. Perhaps the buyer's resources may be limited—he knows he has to have spray equipment of some kind or other, and he buys the best his pocketbook will afford.

Classification of Spray Outfits

Generally speaking, spray equipment comes under four classifications:

1. *Atomizers*, which are usually small devices whereby very small areas or single plants can be given occasional sprays. They are useful only to a limited degree, but they are so inexpensive that anyone can afford them, and everybody who raises fruits or vegetables on any scale whatever should have one.

2. *Bucket and Knapsack Spray Pumps*, suitable for small orchards

(*Continued on page 24*)

Leaf Roller Control in Pacific Northwest

By C. C. Vincent
University of Idaho

IN THE Pacific Northwest, where fruit growing is such a highly specialized industry, an outbreak of any insect pest causing monetary loss to the apple crop is looked upon by the fruit growers with considerable concern. Thus, when the fruit tree leaf roller began to make its appearance in the Spokane Valley, Washington, in 1920, and almost simultaneously appeared in Montana, Idaho, Oregon and Utah, completely defoliating trees and destroying the entire crop, drastic measures were taken to check the outbreak. With such a situation confronting the orchardists, the experiment stations were called upon to control this pest. As a result, carefully planned experiments were conducted in the infested areas, and within a short time definite control measures were worked out.

Distribution

The fruit tree leaf roller, while a new pest in the Northwest, is quite generally distributed throughout the United States. Serious outbreaks have been reported from time to time in various states. It first became known as a very destructive pest in Colorado in 1890. Later it appeared in large numbers on apple, cherry and plum trees in Missouri. It has also been reported as doing considerable damage in orchards in New York, Illinois, New Mexico, California and elsewhere. The history of the occurrence of this insect in the Northwest is similar to that of its appearance in other sections. The insects are very plentiful for a few years, then they gradually disappear. This appears to be the situation in the Northwest at the present time. Undoubtedly the leaf roller has many natural enemies or parasites which tend to hold it in check.

Nature of Injury

The leaf roller does its damage in the caterpillar or worm stage. As soon as the buds unfold in the spring, the worms begin to appear. According to Melander of Washington, six types of injuries are noted, as follows:

1. Mining into and destroying buds.
2. Feeding on stems and buds of young fruit blossoms, causing them to drop later on, even should they grow.
3. Spinning blossoms together so that they cannot open and be cross pollinated.
4. Eating into the reproductive parts of the blossoms, thus preventing the setting of the fruit.
5. Scarring young fruit, causing it to drop or to grow deformed.
6. Feeding on leaves, which in severe cases may result in complete defoliation.

Life History Studied

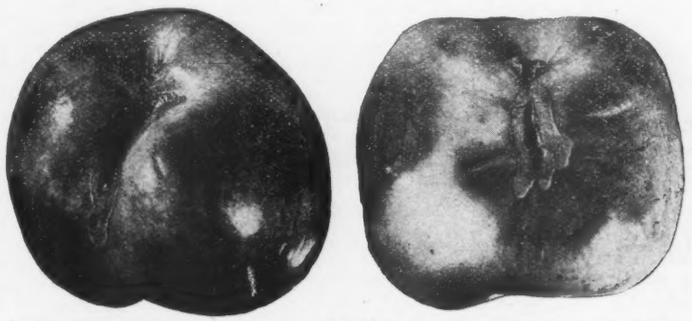
Soon after the leaf roller appeared, a detailed study was made of its life history. It was found that its life cycle passes through four stages: the egg, larva, pupa and adult. The winter is passed in the egg stage. Egg masses were found deposited on the trunks, limbs, twigs and occasionally on the fruit. The female coats the eggs over with a waxy secretion when they are first deposited, thus making them rather resistant to certain sprays, especially when this coating is extra thick. The egg masses are pale brown in color and vary considerably in size. Egg masses have been found containing from six to eight eggs to 100 or more. The average number of eggs per mass was found to be about 35. It is not unusual to find from 100 to 150 of the egg masses, from which 5000 to 10,000 worms will hatch, on a tree.

Egg masses of leaf roller attached to bark of small twigs. Hatching worms have emerged through the holes in the coating

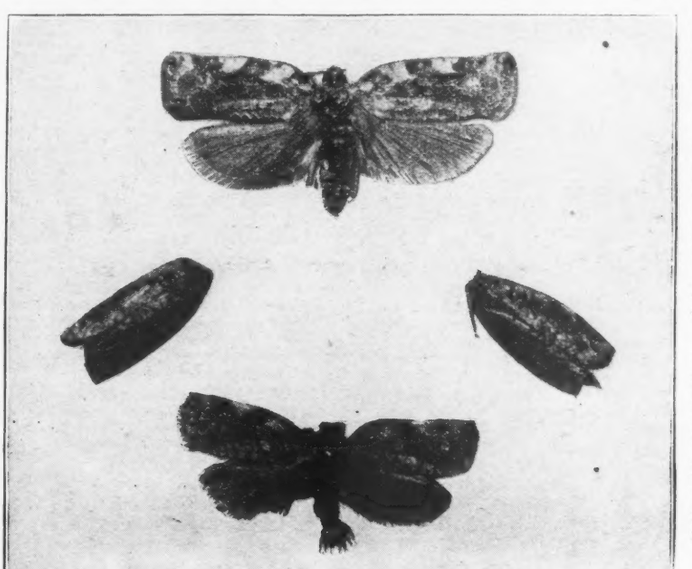
Just about the time the blossom buds begin to show pink, the eggs begin to hatch. The small worms, which are approximately one-sixteenth inch in length, begin immediately to work into the blossoms, often destroying the essential parts of the flower. They are greenish in color and have a brown or black head. After the second or third molt, they tie the leaves together and when full grown, which is around the middle of June, spin themselves up in a silken web and pupate. The moths appear about two weeks later. The adults vary in color from a yellow to yellow with brown mottlings. Soon after the adults appear eggs are deposited. There is only one generation each year.

Lines of Attack

Most of the experimental work conducted in the Northwest during the past few years has been along two general lines: first, spraying with a dormant oil to destroy the over-wintering eggs; and, second, spraying with an arsenical to poison the worms after they had begun to feed on the buds and leaves. Another line of attack investigated by the Washington Experiment Station consisted in spraying with a contact insecticide in order to kill the young larvae.



Apples showing leaf roller scars at time of picking, the injury having been caused during the first two weeks after the fruit had set



Adults of the fruit tree leaf roller. Upper center, female; lower center, male. The front wings are mottled with white and brown markings. The rear wings are ashen gray

The last two methods were discontinued after a year or two as being ineffective for leaf roller control. Spuler of Washington states that the leaf roller caterpillars seem to be remarkably resistant to arsenical sprays. Hawley of Utah says the use of arsenate of lead alone as a control for leaf roller has not proved successful in Utah. In the course of his experiments, trees heavily infested with leaf roller were sprayed when the trees were in the pink stage with arsenate of lead at the rate of eight pounds of the powder to 100 gallons of water, and again just as the petals were falling. The damage to the buds and fruit was not appreciably less than on the unsprayed trees. Regan of Montana, in commenting on the subject, states that some experimenters have recommended the use of arsenate of lead against the leaf roller caterpillar just as the eggs are hatching. His tests indicate that such treatment is little short of a waste of time and material. Our own results with arsenicals in north Idaho were also contradictory and inconclusive. Wakeland in some experiments conducted in south Idaho concludes that lead arsenate at double the strength ordinarily used for codling moth control and applied in both the pre-pink and calyx sprays proved to be of little value. All experimenters agree, however, that in cases of severe infestations of leaf roller, double strength arsenate of lead should be used as a supplement to the oil as soon as the eggs have hatched.

In the use of summer contact sprays, Spuler of Washington concludes that nicotine dust and liquid sprays of nicotine sulphate or Derrisine have given no practical control.

Oil Sprays Efficient

Oil sprays in the light of present experimental data have been much more effective than any of the other materials tested. Two types of oils have been used extensively, that is, the so-called proprietary oils placed on the market by commercial firms under specific trade names, and the home-mixed oils. The commercial oils, while differing in their make-up, are supposed to contain the same ingredients at all times. They ordinarily consist of one or more oils, usually a lubricating oil and an emulsion. While there has been a wide variation in the effectiveness of these various oils when tested by the different experiment stations, many of them have given perfect control. Commercial oil emulsions cost a little more than the home-mixed sprays, but many orchardists would rather pay more for a product which is all ready for use.

Preparation of Home-Mixed Emulsions

Two formulas for making the stock solutions known as the "boiled" emulsion, in which soap is used as an emulsifier, and the "cold-mix" emulsion, in which calcium caseinate is used as an emulsifier, are recommended quite generally in the Northwest at the present time.

BOILED EMULSION

Lubricating oil	2 gal.
Potash fish-oil soap	2 lb.
Water	1 gal.

These three ingredients are placed in a kettle over a fire and boiled until a uniform creamy liquid is formed and the soap dissolved. While still hot the mixture is pumped under pressure into another container, and then back into the first container. A creamy emulsion is formed, known as the stock solution.

COLD-MIX EMULSION

Lubricating oil	2 gal.
Calcium caseinate	4 oz.
Water	1 gal.

The calcium caseinate is dissolved

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Cocoons of the leaf roller in crumpled leaves with empty pupae cases protruding from them

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Hoover's Advice to Apple Growers

IN VIEW of the large apple crop of the past season and the interest that exists in promoting greater consumption of this crop, the remarks of Herbert Hoover last fall to apple growers at Wenatchee, Wash., are quite pertinent. The following extracts are taken from his speech:

"You are faced with an apple surplus this year, and this surplus brings to you a grave problem, and that problem is to prevent the small surplus from setting the price for all the rest.

"You are to blame for the low prices of apples. As growers you have taken very little interest in the problem of ultimate distribution of your products. You compete first with yourselves and next compete with the other apple growing communities of your state and finally compete with the other apple growing regions of the country. You pile up gluts in certain terminals, while there is famine in other terminals. You destroy your own price level. . . .

". . . . From time to time the department of commerce has suggested greater co-operation among the growers of the country. First, there should be co-operation among the growers in each community, and next co-operation of the apple growing districts with each other. That is an ideal that will come sometime, but my feeling is that it will take another quarter of a century. . . .

". . . . The shippers of the country should perfect an organization bearing upon the marketing end of the products they are handling. The shippers need the high vision of co-operation so that the growers' products may be shipped directly from the orchards to the market centers in proportion to the demand of consumption. That is what I mean by establishing a control over the distribution agencies. Then there would be no glut at one point and dearth at another, for the shippers would know what the distribution demands are at all times. . . ."

Mr. Hoover has, in our opinion, outlined a plan of decision which has real merit. What he stands for is organization of the apple interests of the country on a merchandising basis. We believe that in addition to developing such a program, Congress should pass legislation applying the principles of the tariff to agriculture, and that it should distribute taxation more equitably from the standpoint of agriculture. However, legislation providing equality of opportunity will not alone solve the apple marketing problem. The apple growers must organize themselves on the same effective basis as the men in industry and business have organized themselves. They cannot expect substantial relief until a well co-ordinated merchandising program is developed, in which each important factor receives consideration. No half-baked program will do. It has already been demonstrated that attention to production only will not solve the apple marketing problem. Neither can any plan based on advertising alone solve the problem. Only a complete and well-balanced merchandising program will bring the desired results.

Samuel Adams

SAMUEL ADAMS, associate editor of the American Fruit Grower Magazine, died January 4 in Albuquerque, N. M. He and Mrs. Adams had been spending the winter together in southern California and had gone to New Mexico to visit. While seated in a restaurant, Mr. Adams was suddenly stricken, apparently with heart trouble, and he passed away before medical aid could be obtained. Mrs. Adams accompanied the remains across the continent. Interment was made at Greenwood, Va., the home of Mr. Adams.

Mr. Adams is known chiefly for his work in establishing the American Fruit Grower. He started the publication at Charlottesville, Va., in 1915. In September, 1917, he consolidated with his publication, Green's Fruit Grower, established at Rochester, N. Y., in 1880, and the Fruit Grower, established at St. Joseph, Mo., in 1889. The name Green's American Fruit Grower was given to the resulting publication, which became the first fruit growers' journal of national circulation.

In 1922 Mr. Adams sold his paper to the present owners, retaining a small interest and a connection as associate editor. The name was changed to American Fruit Grower Magazine at the time of the transfer.

Mr. Adams owned a fruit farm for seven years in Albemarle county, Virginia, near Charlottesville. It was while located at this place that he saw the opportunity to develop a fruit growers' journal, and he edited the American Fruit Grower from this place for two years. Later, he moved his headquarters to Chicago.

After selling out his chief interest in the magazine, Mr. Adams made his home part of the time at Greenwood, Va., and part of the time in Washington, D. C. He edited a monthly magazine, Public Affairs, for several years, selling out his interest in the spring of 1926. He was a candidate for vice-president in 1920 and was mentioned from time to time in connection with various political and diplomatic positions. He was a descendant of John Adams, second president of the United States. He possessed a most genial and pleasing disposition, and those who worked with him had the highest respect for his fairness and his sincerity of purpose.

A Well-Balanced Program Needed

L. J. TABOR, master of the National Grange, expressed a viewpoint in his annual address to his organization with which we heartily agree. The gist of Mr. Tabor's viewpoint is contained in one of his sentences, which is as follows:

"Relief for agriculture, in its present unsatisfactory condition, will come not as a result of any one piece of legislative statute but as a result of a program for the betterment of rural life."

Mr. Tabor then added that legislation can simply be of an enabling nature and that no matter what legislation is passed, there will be parts of the program which will have to be solved by the farmers and fruit growers themselves through their organizations and in co-operation with other interests.

We agree with this viewpoint. Agriculture needs legislation by Congress that will apply the principles of the tariff to agriculture and give the farmers and fruit growers a fair break in the distribution of the national income. Nothing that the farmers can do themselves will help them along this line. Our tax program needs to be studied and adjustments must be made to distribute taxation more equitably. The development of further reclamation projects should be discontinued at the present time.

In addition to these things, the farmers and fruit growers themselves will have to work out more efficient methods of merchandising their products, the same as the men in business and industry have done. Such methods must involve a well-balanced program in which production, standardizing, advertising, distribution and salesmanship are all properly co-ordinated. Full relief cannot be obtained until all of these factors receive proper attention.

Another Spraying Issue

WE ARE pleased to again present to our readers a special issue on spraying and related subjects. As usual, the February issue is devoted to spraying calendars for each important fruit section and to special articles on subjects of outstanding importance.

The spray calendars were prepared in most cases by the same authorities who prepared them last year. Prof. W. P. Tufts of California is taking graduate work in Wisconsin this year, and Prof. A. H. Hendrickson prepared the calendar for northern California. Prof. R. W. Hodgson of California recommended that we get Prof. E. O. Essig to prepare the calendar for southern California, and we did so. The apple calendar for the Shenandoah-Cumberland district was prepared by a joint committee consisting of representatives from Ohio, West Virginia, Virginia and Maryland, and the calendars for the other fruits were furnished again by Prof. F. A. Motz of Virginia. Aside from these variations, the calendars were all prepared by the same authorities as last year.

With the co-operation of the authors, we have clarified and standardized the calendars as far as possible. Formulas have been simplified with the object of preventing misinterpretations. For instance, many of the calendars of previous years contained such expressions as 1 to 8, 1 to 10, etc. In such cases, it was not clear whether the authors meant one gallon of lime-sulphur and eight gallons of water, or one gallon of lime-sulphur and seven gallons of water to make eight gallons of finished product. It seems that there has been a lack of uniformity in the intentions of different authorities regarding such recommendations. Accordingly, we have eliminated such expressions and are using this year a form which we believe can be interpreted in only one way. We have also standardized the form of the calendars in most cases and have added explanations which help to make each calendar a complete story in itself.

We hope you will like the calendars in the form in which we have presented them and that they will be more useful to you than ever before. You will do us a real favor by letting us know what you think of them. If you can make suggestions for their further improvement, kindly do so.

Diseases of Raspberries and Their Control

By C. A. Boyer
Michigan State Department of Agriculture

IN THE early days of raspberry culture, diseases were not a serious matter, but as the industry has developed in the different producing sections, the diseases common to these fruits have become important factors in growing the crops. Without doubt, other factors, such as soil treatment, cultural practices and pruning, play an important part in successful production of raspberries, but there can be no question but that the disease factor is the most serious single problem facing the raspberry industry today. The writer has had opportunity to observe the behavior of the diseases common to raspberries in connection with the inspection of thousands of plantations in Michigan and in this article is endeavoring to present information that will assist growers in identifying and combating these diseases.

Classification of Raspberry Diseases

The diseases of raspberries can be classified into three groups, namely, those caused by bacteria, true fungi and virus.

Bacteria are microscopic one-celled organisms which multiply rapidly by simple cell division. A good example of a disease caused by bacteria is crown gall.

The true fungi develop in their vegetative stage a thread-like growth, and they produce spores which are disseminated largely by wind, water and insects. These spores are comparable to the seeds of higher plants. A good example of a disease caused by true fungi is anthracnose.

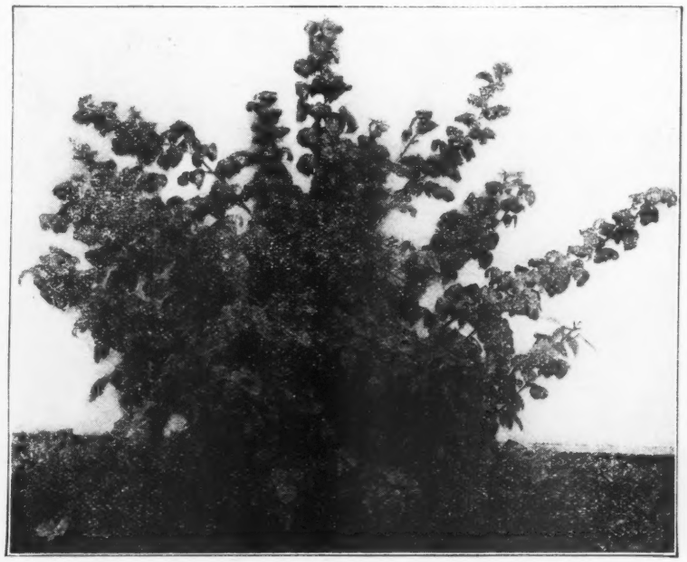
Virus diseases undoubtedly cause more loss in raspberries than either the fungi or bacteria. The nature of these diseases is not definitely known. No parasitic organism has been found responsible for causing them. Apparently enzymes or physiological conditions are responsible for them. A bush which is infected by one of these diseases never recovers. If one part of the plant is attacked, the entire bush becomes diseased. Suckers or tips taken from a diseased plant are likewise infected. Experiments have proved that where plants have been infected with a virus disease, the same can be reproduced by introducing tissue or juice of the plant into healthy plants. So far, mechanical means, such as bruising or injecting with a needle, have not been successfully used in transferring the disease from one plant to another. The Michigan Agricultural Experiment Station states that aphids of at least two genera are responsible for spreading these diseases. As is well known, the aphids move about from leaf to leaf and from plant to plant and in this manner introduce the disease into new plants. Three of our most serious raspberry diseases, namely, leaf roller, mosaic and streak, are caused by virus. It behooves every grower to acquaint himself thoroughly with these diseases so that he may be able to detect and combat them in his berry plantations.

Identification and Methods of Control

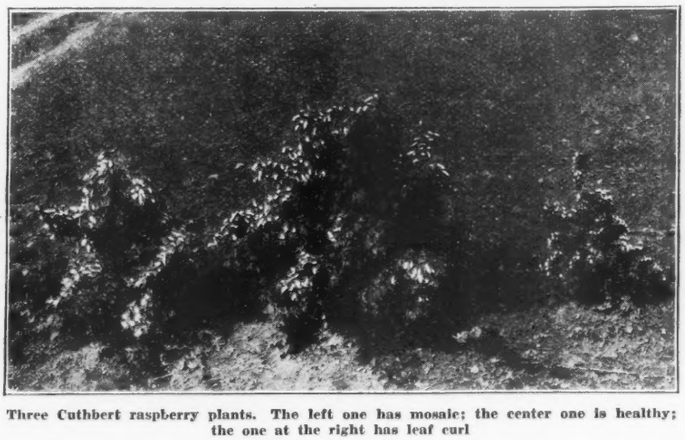
Mosaic is a virus disease which attacks black, red and purple raspberries. It is widespread throughout the United States and is very serious in the raspberry industry. In the early stages of the disease, the leaves show large, irregular, dark green blisters which tend to be arched upward, the remainder of the leaf showing a somewhat yellowish discoloration. The stems in badly diseased plants are short and appear stunted. Quite often the laterals of the fruiting canes are short and a rosetting of the leaves occurs. The fruit which is produced by a badly infected bush is dry, seedy, tasteless and usually unfit for commercial use. Mosaic appears on the young leaflets in early spring and can be detected throughout the season, although it is more pronounced in the early spring or late summer. The disease is more noticeable in cool than in hot weather.

Leaf Curl

Leaf curl, a virus disease, is somewhat common on the red raspberry throughout the United States and occurs locally in a number of states on the black raspberry. The symptoms of leaf curl are more conspicuous and pronounced than those of mosaic. The disease is somewhat easier to eradicate. The leaves first appear puckered and somewhat rounded. with the edges and tips curled downward, having a darker green color and being usually smaller than normal leaves. The plants usually are somewhat dwarfed and a shortening of the internodes can be noticed. Each successive year finds the canes less vigorous and the new canes continue to become shorter. The most pronounced symptom of leaf curl is found on the tip leaves; they arch upward, with the veins being somewhat sunken. The leaves are rigid and firm and nearly circular in outline. The fruit ripens prematurely, and it is small, seedy, dry with poor flavor, and valueless for marketing purposes.



Near view of a Cuthbert plant 12 months after infection with leaf curl



Three Cuthbert raspberry plants. The left one has mosaic; the center one is healthy; the one at the right has leaf curl

Streak

Streak, sometimes called rosette and eastern blue stem, is a virus disease which attacks black raspberries and has been found on some varieties of purple canes. Streak is usually most noticeable at the blossoming season or a little later. Tip leaves of the young canes show a peculiar curling, with the midrib of the leaf recurved, and tend to curl downward; in severe cases, the leaves roll into a cylindrical shape. The disease attacks the young leaves of the vigorous growing parts of the plant. Canes badly infected with streak show a stunted effect, while the leaves tend to appear in rosettes. Late season finds the leaves showing an indefinite mottling of light and dark areas, and the disease can then be distinguished from mosaic in that the dark areas on the leaves are not arched upward. Purple streaks, dots and irregular vertical stripes are usually present on the stems of the young canes during June and July, depending somewhat on the states in which raspberries are grown. The plants in young plantations that are badly diseased appear weak and sickly, the leaves being curled or recurved and the fruit of poor quality and small.

The above three virus diseases are very difficult to control. The best method of preventing their spread is by *roguing*, by which is meant inspection of the plants and destruction of all diseased plants. Plantations of berry plants should be inspected at least twice a season, the first inspection being made in early June or July and the second in late August and September. Great care should be taken in digging out the diseased plants so that all of the roots will be removed. The entire plant should be burned as soon as it is removed. Thorough and repeated inspections throughout the season should be applied. Care should be taken to avoid scattering the aphids when removing plants, since this precaution has been found very effective in checking spread of the disease. It is vitally necessary to detect these diseases in their early stages and remove the plants if the best results are to be obtained. Growers should demand only certified stock when securing plants for planting purposes and should never make a practice of using stock from badly diseased fields or fields which have not been inspected. It is only through the most careful means of roguing and inspection that we can hope to stamp out the virus diseases and save the commercial varieties of raspberries.

Anthracnose

Anthracnose is a fungous disease which attacks mainly black raspberries, but it sometimes occurs on red and purple varieties. The disease is widespread and very destructive to commercial berry plantations. The fungus is very noticeable on the canes; frequently they are spotted with grayish areas. As the disease advances, the spots continue to enlarge and become buff or grayish in color, while the outer portion of the area is somewhat raised and purple in color. The infected area enlarges, and ofttimes it girdles the cane, hindering the sap flow, this in return stunting the growth of the plant and decreasing the size of the fruit until it shrivels up or dies on the bush. In badly infected plantations, the leaves are attacked and they show irregular spots having the buff colored centers with purple margins; occasionally the diseased tissue drops out, leaving the shot hole effect. Anthracnose can be kept under control provided the grower will observe the following precautions:

1. Select disease-free stock.
2. All fruit canes should be cut out and burned following berry harvest.
3. Clean cultivation.
4. Spray the plants every season with either lime-sulphur 1 to 10 or Bordeaux mixture 4-4-50, using it as a delayed dormant spray or when the leaves just begin to show green. When canes are badly diseased, make a second application not later than seven to 10 days before blossoming, using lime-sulphur 1 to 40.

Cane Blight

Cane blight, one of the fungous diseases, is quite widely distributed throughout the bramble fruit sections and attacks both black and red raspberries, preferring somewhat the blackcap. The purple cane appears to be fairly resistant to this fungus. Cane blight is more serious when we have a warm, wet summer, followed the next year by a wet spring, with a dry period during the ripening season. The fungus winters over on both old and new canes, and it enters the bark through a wound made either by mechanical injury or by insects. The disease oftentimes starts at the surface of the pruning wound and works downward, killing branches as it advances. The canes first begin to wilt and die. The infected part of the cane is somewhat lighter in color, and oftentimes on the surface of the lesions small black dots may be observed, surrounded by smoke colored patches. These are the spores of the fungus and are carried to other healthy plants by means of rain, mist or insects. So far as known, the fungus gains entrance only through wounds on the canes; wounds are more or less numerous and there is ample chance for infection. Cane blight has not been readily controlled, due to the fact that the

(*Concluded on page 28*)

Spray Schedule for New York

Prepared by Entomologists and Plant Pathologists of the New York State Agricultural Experiment Station and the New York State College of Agriculture

APPLES

Time of Application.	Spray Mixtures.	For Control Of.	Dust Mixtures.
Delayed dormant. When leaves of blossom buds are out ¼ to ½ in.	Lime-sulphur 11 gal., arsenate of lead 2½ lb., nicotine sulphate ¾ pint, water to make 100 gal.	Scab, scale, blister mite, bud moth, leaf roller, casebearers, aphids.	No satisfactory dust for scale or blister mite.
Pre-blossom. Two applications between delayed dormant and calyx periods are necessary in a rainy season.	Lime-sulphur 2½ gal. arsenate of lead 2½ lb., water to make 100 gal.	Scab, green fruit worms, bud moth, leaf roller, casebearers.	Apply 90-10 sulphur-lead arsenate dust.* If conditions are favorable for a bad outbreak of scab, spray as much as possible, using dust to complete the operation on time. In combating rosy aphis with dust mixtures the most promising means of control is a heavy application of a mixture containing not less than 2% nicotine as blossom buds begin to show pink.
Calyx. When the last of the petals are falling.	Lime-sulphur 2½ gal., arsenate of lead 2½ lb., nicotine sulphate 1 pint, water to make 100 gal.	Scab, codling moth, green fruit worms, bud moth, curculio, lesser apple worm, redbugs.	Apply 90-10 sulphur-lead arsenate dust.* For redbugs, use 90-10 dust with 2% nicotine. If conditions are favorable for a destructive outbreak of scab, spray as much of the orchard as possible, using dust in a supplementary capacity.
Later sprays. To be determined by weather conditions and control of scab.	Lime-sulphur 2½ gal.**, arsenate of lead 2½ lb., water to make 100 gal.	Scab, codling moth, curculio, lesser apple worm, apple maggot.	Later applications with 90-10 sulphur-lead arsenate dust.* During prolonged rainy periods it is advisable to make applications of dust at shorter intervals than indicated for spray mixtures.

*Copper lime dust may cause russeting, especially at the calyx application. At this time use spray or 90-10 sulphur-lead arsenate dust.

**If foliage injury is feared, the most satisfactory alternative for lime-sulphur is the wettable sulphur spray as described below under "General Remarks."

PEACHES

Time of Application.	Spray Mixtures.	For Control Of.	Dust Mixtures.
Late fall or early spring, before buds swell.	If scale is abundant, use lime-sulphur 11 gal., water to make 100 gal. If there is no scale, use lime-sulphur 6½ gal., water to make 100 gal.	San Jose scale, leaf curl. Leaf curl.	Dust not advised.
When blossoms show pink.	Sulphur-lime dry mix.	Blossom blight, brown rot.	Apply 95-5 sulphur-lead arsenate dust.
When shucks are falling.	Sulphur-lime dry mix and arsenate of lead 3 lb. in 100 gal.	Brown rot, scab, curculio.	Apply 90-10 sulphur-lead arsenate dust.
Two or 3 weeks after shucks fall.	Sulphur-lime dry mix.	Brown rot, scab.	Apply 95-5 sulphur-lead arsenate dust.
Two to 4 weeks before fruit ripens.	Sulphur-lime dry mix.	Brown rot, scab.	Apply 95-5 sulphur-lead arsenate dust.

Dry mix sulphur-lime is prepared as follows:

Superfine sulphur.....16 lb.
Hydrated lime..... 8 lb. } For 100 gal. water.
Calcium cascinate.... 1 lb.

Mix the materials dry, then add to the water in the spray tank while agitator is running.

CHERRIES

Time of Application.	Spray Mixtures.	For Control Of.	Dust Mixtures.
Delayed dormant. When bud scales separate and expose green blossom buds.	(For sweet cherries only.) Lime-sulphur 11 gal., nicotine sulphate ¾ pint, water to make 100 gal.; or nicotine sulphate ¾ pint, soap 5 or 6 lb., water to make 100 gal.	Scale, aphids. Aphids.	No satisfactory dust for scale. Control of aphis by 90-10 sulphur-lead arsenate dust with 2% nicotine not yet demonstrated. Thorough dusting with 2% nicotine dust should reduce number of insects.
Just before blossoms open.	Lime-sulphur 2½ gal. water to make 100 gal.	Brown rot, blossom blight.	Apply 95-5 sulphur-lead arsenate dust.
When petals fall.	Lime-sulphur 2½ gals. (sweet cherries 2 gal.), arsenate of lead 2½ lb., water to make 100 gal.	Leaf spot, brown rot, curculio.	Apply 90-10 sulphur-lead arsenate dust, or if curculio is abundant, 80-20 sulphur-lead arsenate dust.
Ten days after petals fall or when shucks are off.	Lime-sulphur 2½ gal., (sweet cherries 2 gal.), arsenate of lead 2½ lb., water to make 100 gal.	Leaf spot, brown rot, curculio.	Apply 90-10 sulphur-lead arsenate dust, or if curculio is abundant, 80-20 sulphur-lead arsenate dust.
As Early Richmond cherries show red on one side.	Lime-sulphur 2½ gal., (sweet cherries 2 gal.), arsenate of lead 2½ lb., water to make 100 gal.	Maggot, leaf spot, brown-rot.	The merits of dusting in controlling fruit flies are not definitely established; if dusting is preferred, apply 90-10 sulphur-lead arsenate dust.
As Montmorency cherries show red on one side.	Lime-sulphur 2½ gal., (sweet cherries 2 gal.), arsenate of lead 2½ lb., water to make 100 gal.	Maggot, leaf spot, brown-rot.	The merits of dusting in controlling fruit flies are not definitely established; if dusting is preferred, apply 90-10 sulphur-lead arsenate dust.
After picking.	Lime-sulphur 2½ gal., (sweet cherries 2 gal.), arsenate of lead 1 to 2 lb., water to make 100 gal.	Leaf spot.	Apply 95-5 sulphur-lead arsenate dust.

PEARS

Time of Application.	Materials to Use.	For Control of.
Dormant. Early in the spring when the adult thrips first appear on the buds, just as the bud scales begin to separate.	Miscible oil 5 gal., nicotine sulphate 1 pint, water to make 100 gal.	Thrips.
Cluster bud. When cluster buds have separated (Bartlett); when they begin to separate (Kieffer).	Lime-sulphur 11 gal., water to make 100 gal.	Scale, scab, psylla eggs.
Calyx. Just after petals fall.	Lime 30 to 40 lb., copper sulphate 2 lb.*, arsenate of lead 2½ lb., nicotine sulphate 1 pint, water to make 100 gal.	Codling moth, psylla nymphs, scab.
About 2 weeks after petals fall.	Lime-nicotine dust (2% nicotine).	Psylla flies.
	For scab susceptible varieties use Bordeaux 3-10-50.	Scab.
Emergency application in summer when psylla become abundant.	Lime 30 to 40 lb., copper sulphate 2 lb., nicotine sulphate 1 pint, water to make 100 gal.	Psylla nymphs, scab.
	Lime-nicotine dust (2% nicotine).	Psylla flies.

*The use of lime-sulphur solution at this time is not advised because of the danger of foliage injury. For those who do not wish to use the lime-copper sulphate mixture, the wettable sulphur spray as described under "General Remarks" is recommended. One pint of nicotine sulphate, 2½ lb. arsenate of lead and 32 lb. hydrated lime should be added to each 100 gal. to kill psylla and dry up the honey dew.

PLUMS

Time.	Materials to Use.	For Control of.
While buds are dormant.	Lime-sulphur 11 gal., water to make 100 gal. (all varieties).	Scale.
When shucks are off young fruits.	Lime-sulphur 2 gal., arsenate of lead 2½ lb., water to make 100 gal. (all varieties except Japanese).	Leaf spot, brown rot, curculio.
From 14 to 20 days later.	Lime-sulphur 2 gal., water to make 100 gal. (all varieties except Japanese.)	Leaf spot, brown rot,
Before fruit ripens.	Lime-sulphur 2 gal., water to make 100 gal. (all varieties except Japanese).	Leaf spot, brown rot,

JAPANESE VARIETIES

On Japanese varieties follow the same schedule as to time of spraying. For the application when the buds are dormant, use lime-sulphur 1 to 8, as directed above. For subsequent applications, instead of lime-sulphur solution use self-boiled lime-sulphur 8-8-50, lime-sulphur glue mixture, or sulphur dust. When poison is needed in the dust, use 10% dry powdered arsenate of lead and 90% sulphur. Replace the lead with filler when poison is not needed.

GRAPE SPRAY SCHEDULE FOR FINGER LAKES REGIONS

Time of Application.	Materials to Use.	For Control of.
About 1 week before the blossoms open.*	4-4-50 Bordeaux.	Black rot, mildew.
As soon as the berries set.	4-4-50 Bordeaux. If larvae of flea beetle are present, add arsenate of lead 1½ lb.	Black rot, mildew, flea beetle.
Two weeks later. Subsequent applications to be determined by weather conditions and the previous control of black rot and mildew.	4-4-50 Bordeaux.	Black rot, mildew.

*If black rot has been severe in past years, make an early application when the second or third leaf is showing, using Bordeaux 4-4-50.

Grape leaf hopper may be controlled by very thorough spraying, using the following formula: Bordeaux 4-4-50, nicotine sulphate ½ pint in 50 gal. of water. The application should be made soon after July 4 when the newly hatched nymphs are on the leaves. An upturned nozzle must be used and care taken to hit the insects. Unless the leaf hoppers are extremely abundant, a special spray for this insect is not likely to be profitable.

GRAPE SPRAY SCHEDULE FOR CHAUTAUQUA GRAPE REGION

Time of Application.	Materials to Use.	For Control of.
Just as soon as the fruit has set. Make special effort to place spray on the clusters.	4-4-50 Bordeaux, arsenate of lead 1½ lb., resin fish-oil soap 1½ lb.	Berry moth, powdery mildew.
This is a special berry moth spray and can be omitted if the pest is not present.		
When the root worm beetles first appear in numbers.	4-4-50 Bordeaux, arsenate of lead 1½ lb., resin fish-oil soap 1½ lb.	Root worm, berry moth, powdery mildew.
Ten days to 2 weeks later.	4-4-50 Bordeaux, arsenate of lead 1½ lb., resin fish-oil soap 1½ lb.	Rott worm, berry moth, powdery mildew.
When the maximum number of leaf-hopper nymphs are present, usually between July 12 and 20.	Nicotine sulphate ¾ pint, resin fish-oil soap 3 lb.; or hydrated lime 8 lb., water 100 gal.	Leaf hopper.
During certain seasons this spray can be combined with the preceding.		
Special rose chafer spray. Apply as soon as the beetles appear.	Confectioners' glucose 25 lb. or cheap molasses 2 gal., arsenate of lead 5 lb., water to make 100 gal.	Rose chafer.

GENERAL REMARKS

Arsenate of Lead—The amount of arsenate of lead is given in these schedules for powder form; if paste form is used, twice as much is required.

Lime-sulphur—The directions for lime-sulphur are based on the standard strength 32 to 34 degrees Baume solution.

Wettable Sulphur—For making the wettable sulphur spray, 8 lb. hydrated lime, 16 lb. superfine sulphur and 8 oz. calcium caseinate are used in 100 gal. water. The materials can be mixed dry during the winter or rainy weather and stored for use. If is prepared in the spray tank as follows: Fill the tank half full of water; then, with agitator running, add the dry material slowly, directing the spray nozzle upon the material until it has all disappeared in the water.

Control the Pecan Borer with Carbon Bisulphide

By Jeff Chaffin

THE BEST way to control the worm or larva that bores holes or tunnels in pecan trees is by the use of carbon bisulphide gas. Drop a few drops of this liquid in each hole on the trunk and branches of the tree, then seal up the holes with putty, stiff clay or some other substance. This liquid vaporizes very quickly and the insect inhales the gas and dies.

Fifteen grains of 50 per cent calcium cyanide when used in the same manner as carbon bisulphide will give just as good results.

The presence of this insect can be detected by the frass and castings of wood about the base of the tree. This frass and wood castings are thrown out of round or oval shaped holes about one-fourth inch in diameter, which may be found on the trunk and large branches of the pecan trees. Sometimes you will notice a mass of gum or sap exuding from these holes.

This larva bores deep tunnels into the hard wood of the tree, making irregular galleries several inches in length. The full grown larva is about one and one-half inches in length and pink in color. In the spring these larvae transform into pupae and emerge as grayish colored moths with a wing expansion of about one and three-fourths inches.

This insect does serious damage to oak and hickory trees as well as the pecan. Many fine shade trees die each year from injury received by this borer.—*Georgia Agricultural Bulletin.*

Save valuable time this summer by getting your repair work done during the winter months.

Shall We Spray With Oil?

By E. J. Newcomer
United States Bureau of Entomology

OIL SPRAYS, which formerly were used only in a very limited way, have increased in popularity very rapidly in the last few years. About five years ago the fruit growers of the Middle West found that lime-sulphur was relatively ineffective in controlling the San Jose scale. Experiments made by the Bureau of Entomology of the United States Department of Agriculture showed that a lubricating oil emulsion was more effective in the Ozarks than lime-sulphur, and in a short time oil almost displaced lime-sulphur in that region. Although lime-sulphur has been very effective in other districts, a number of questions naturally arose. Could oil be used as a dormant spray in other fruit growing districts? What pests besides the San Jose scale could be combated with the dormant application? What kinds of oil could be used? How were they best emulsified? Were there any possibilities of using oil emulsions during the growing season? And so on.

As a result, numerous experiments have been made by federal and state investigators, as well as by insecticide manufacturers and oil companies. Much has been published on the subject of oil sprays. Investigations are still under way. The problem is so large that much more work on it is required.

In the meantime, let us examine the practical conclusions that have been reached. Let us do this with the realization that we are in the midst of the problem, and that what we believe today may be upset tomorrow.

Making Oil Sprays at Home

When the use of oil for spraying began to increase, there were few commercial oil sprays on the market, and relatively little was known about them. Some of them were expensive. It seemed to be more economical and more satisfactory for the grower to make his own oil sprays. A number of formulas were tried, and several of them have proved to be quite satisfactory.

It is necessary to emulsify the oil in order to dilute it with water before it is used. Fish-oil soap is a very effective emulsifier in regions where soft water is available. For use with hard water, the caseinate formula is to be preferred, as the soap emulsions are apt to be broken down by the hard water. It is also possible to make a miscible oil. Any of these methods, in the hands of careful and intelligent growers, have been very successful. Most of the failures have been due to carelessness or ignorance.

It is impossible, in a general article, to give directions for making oil sprays. Oils procurable in the Ozarks may not be available in the Wenatchee Valley or in California. An emulsifier that works in one district may not work in another. Many kinds of oil are available, some of them being useless for spraying and others very useful. In general, the dormant sprays require the use of a light lubricating oil of the red engine or brown neutral type. Replies to a questionnaire sent out last year by a committee on oil emulsions of the American Association of Economic Entomologists indicated that a satisfactory oil should have a volatility of less than one per cent, a Saybolt viscosity (at 100 degrees Fahrenheit) of 180 to 220 seconds, and a specific gravity of 0.88 to 0.91 at 20 degrees Centigrade. As a matter of fact, certain western oils having a volatility of nearly three per cent and a viscosity of about 120 seconds have given good results. No oil should be used unless it has previously been tried in the district and found to be satisfactory. Growers contemplating the manufacture of oil sprays should obtain information on the subject from their extension agents or state experiment stations.

Good Commercial Preparations Available

It is no longer necessary for the grower to make oil sprays, as there are now many commercial sprays which are as good as or better than the home-made emulsions. Advice should be secured from competent authorities before deciding on the particular commercial oil spray to use.

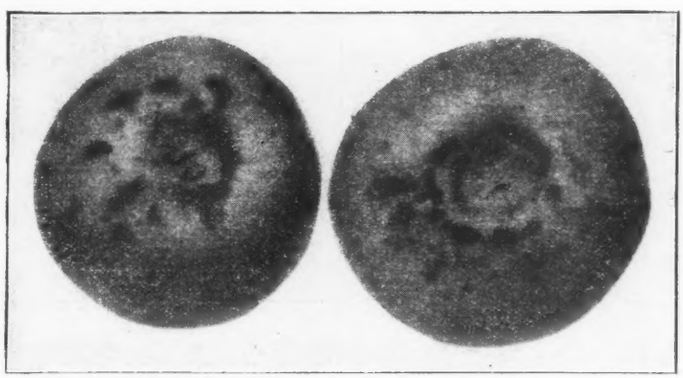
In using oil sprays, whether made at home or commercially prepared, certain precautions should be observed. The grower should know what a good emulsion looks like when diluted. It should have a uniform, creamy appearance. If it is curdled, or has much free oil on the surface, it should not be used. Nor should a dilute oil spray be used that has stood in the tank over night. The ingredients have probably separated. If there is any free oil at all on the surface of the dilute spray, the last few gallons in the tank should not be sprayed on the trees. Do not mix the oil emulsion with lime-sulphur or other forms of sulphur, unless the manufacturer says it may be done. A mixture of this sort, used on trees in leaf, will probably cause severe burning. Even if the oil is applied within three or four weeks of a lime-sulphur application, the same thing may occur.

Dormant Oil Sprays

The primary use of a dormant oil spray on deciduous trees is to combat the San Jose scale. In the Middle West, good results have been obtained with an oil emulsion diluted to contain two per cent of oil. A dilution of three per cent is recommended for heavy infestations of scale. In the West, it has been found necessary to use four per cent of oil for heavy infestations. Oil has been used to kill the eggs of the fruit tree leaf roller for many years, and when these are present, six or seven per cent oil should be used. Careful spraying must be done, as there is no indirect effect of the oil.

In addition to controlling the San Jose scale and the leaf roller, this dormant oil kills many other scale

(*Continued on page 27*)



Jonathan apples scalded by three applications of one per cent oil emulsion

Winter Precautions Against Pear Blight

By L. H. Day
University of California

SERIOUS blossom and twig blight infection in the spring usually has its source in over-wintering cankers in the rough bark about the trunk and crotches. The areas of worst infection in an orchard can almost always be traced to an over-wintering canker either in the root or in the aerial parts of the tree. In orchards where blight has been at all plentiful, every tree should be examined carefully, and all spots looking like blight should be gouged to make certain. A narrow, half-round gouge is a very good tool for this inspection work if the bark is scaly and hard. Some growers prospect every tree during the late fall and early winter by gouging into the heavy bark about the trunks and crotches, even though suspicious signs are not present in those parts. This is advisable if the disease has been very prevalent in the orchard. The wound so made should be disinfected as well as the tools.

This work should be entrusted only to men who have had experience with blight. Any others might do more harm than good. It takes an experienced worker to distinguish a small, dormant blight canker from a large patch of bark which is beginning to die in the natural way pear trees have of shedding their bark.

Inspection should precede the pruning work, for it is possible to spread blight with the pruning shears. Cankers which continue to develop during the late fall and winter are sources of infection. If the pruning must start before the blight work, then each pruner must carry a bottle of disinfectant and brush and disinfect his shears whenever he cuts unhealthy wood or after finishing each tree. Pruners who are inexperienced with pear blight should be instructed to cut dead branches and twigs far below the lowest dead area and to report any cankers noticed in the larger branches.

Winter is the proper time to remove suckerous growth and fruit spurs from the body and the lower parts of the scaffold branches. To do so during the summer exposes the wounds to blight infection and encourages new shoots to grow which are more easily affected than those removed. It is a good policy to discourage fruit spurs from growing on these parts of the tree if the blight is prevalent in the district.

Treatment of Hold-Over Cankers

It is not usually possible to save branches or trees by the scarification method during the late fall and winter, when the blight has gone completely around them. In cankers as old as these, the blight has usually penetrated to the cambium layer in so many places, or in streaks, as to make it impossible to pare it out and save the cambium. However, some of these cases could be saved by very careful and experienced workers. In some situations, however, blight in the Bartlett pear tree does not run deep at any time of the year in a large proportion of the cankers. In this case, careful workers can pare away the diseased outer bark and save the cambium. The cambium layer will then form a new bark over the whole surface the following spring.

Some workers using the scarification method do not pare deep enough and hence do not succeed in arresting the development of a large enough percentage of cankers to justify their using this method.

In the case of cankers which do not pass completely around the branch, it is possible to save the branch even if the cambium has been injured in the central or older portions of the canker. In advanced cases, it is necessary to use extreme precautions to shave deep enough to make certain that there are no deep stringers of the disease passing beneath the healthy bark at the ends of the canker. In the central portions of these advanced cankers, it is not necessary to scrape off the cambium and expose the wood, even if the disease has injured the cambium in streaks. The advantage of the scarification system as applied to these older cankers is that there are often areas in the central portion where the cambium can be saved and the injury soon healed over; whereas, in the older system of scraping the wood all over the canker, the area never heals over. Again, in actual practice, there are in the older system as many failures to stop blight as there are in the scarification system if the operator is properly instructed in the latter process. In other words, if it is desired to save a branch or tree containing a side canker, the scarification operation is as safe as the older method provided the operator understands the new system of scarification.

At the beginning of the blossoming period the orchard should be inspected repeatedly for oozing, hold-over blight cankers which may have escaped the winter inspections.

The disinfectant consists of cyanide of mercury and bichloride of mercury in glycerine and water. The half gram tablets are used. Sixteen tablets of each kind are dissolved in one quart of water, preferably hot, and then three quarts of glycerine are added to this.

Directions for Scarifying

For the benefit of those who wish to use the scarification method, the following directions are given. The operator, however, should see the method demonstrated in order to grasp the idea. The diseased bark should be shaved inwardly until practically all of the diseased tissues are removed. The disinfectant will then penetrate sufficiently to kill the bacteria and arrest the disease. This will apply also to new cankers at any time of the year. There will be many cankers, however, in which the bark will have to be shaved so far inward that the disinfectant may penetrate and injure too much of the cambium layer. In these cases, the formation of new bark over the cankered area will be very slow and the branch may not be very vigorous thereafter. However, in such cases new vigorous shoots will develop below the scarified area; these may be trained up to take the place of the old one. It requires experience to judge whether or

(*Concluded on page 43*)

Spray Calendar: Shenandoah–Cumberland Region

The apple spray program given below was prepared jointly by representatives of the agricultural experiment stations of Virginia, West Virginia, Maryland and Ohio. It is intended for the Cumberland-Shenandoah section and the upper Ohio Valley. While the Pennsylvania authorities took part in the conferences at which this schedule was prepared, and while they agree with practically all the recommendations, they feel that Pennsylvania conditions require a somewhat different treatment in certain instances.

The schedule is intended primarily as a general guide to growers of the district. In each state, the orchardists are advised to consult also the spray calendars issued by their own extension departments and to follow their recommendations when the conditions are at all unusual. The apple calendar was sent to us by Prof. L. M. Peairs, entomologist of the West Virginia Agricultural Experiment Station.

The spray calendars for the other fruits were prepared by the Departments of Horticulture, Plant Pathology and Entomology of the Virginia Polytechnic Institute and were furnished to us by Prof. F. A. Motz, extension horticulturist. While these recommendations were prepared primarily from the standpoint of Virginia conditions, it is believed that they will apply also to most other sections of the district. Growers in the states other than Virginia are advised to consult the recommendations of the extension departments of their own states when conditions are at all abnormal.

APPLES

Time of Application.	Materials to Use.	For Control of.
Dormant. Late winter or early spring when temperature is well above freezing.	Oil emulsion 4½ gal. (see General Remarks), water to make 100 gal.; or tested proprietary oils. This application is usually unnecessary.	Scales and European red mites.
(1) Delayed dormant. Begin when blossom buds first show green and complete before leaves have extended ⅜ in.	Lime-sulphur 12 gal., water to make 100 gal.; or dry lime-sulphur 30 lb., water 100 gal.; or engine oil emulsion 4½ gal., water to make 100 gal.; or other oils known to be safe. For aphids add ¾ to 1 pint nicotine sulphate to 100 gal.	Scales, aphids, European red mite. Note—Oils must be used to control the red mite.
(2) Pre-blossom. When cluster buds begin to separate, or as announced by the Spray Service.	Lime-sulphur 2½ gal., arsenate of lead 3 lb., water to make 100 gal.; or dry lime-sulphur 7 lb., arsenate of lead 3 lb., water 100 gal. (Virginia omits arsenate except for curculio.)	Scab, leaf spot (frog-eye), mildew, curculio, canker worms, bud moth and other chewing insects.
(3) Petal-fall. When most of the petals have fallen.	Lime-sulphur 2½ gal., arsenate of lead 3 lb., nicotine sulphate 1 pint, water to make 100 gal.; or dry lime-sulphur 6 lb., arsenate of lead 3 lb., nicotine sulphate 1 pint, water 100 gal.	Scab, leaf spot, mildew, codling moth, curculio, red bug, and other chewing insects.
(4) Three-weeks. About 3 weeks after petal-fall spray. Date in W. Va. to be announced by the Spray Service.	Same as for petal-fall spray, except that Bordeaux may be advised by the spray service in place of lime-sulphur. Lime-sulphur must not be applied in bright sunshine when temperature is above 85 degrees.	Codling moth, curculio, scab, Brooks' spot, blotch, leaf spot.
(5) Five-weeks. About 5 weeks after petal-fall spray. Date in W. Va. to be announced by the Spray Service.		Codling moth, curculio, scab, Brooks' spot, blotch, leaf spot.
(6) Seven-weeks. About 7 weeks after petal-fall spray. Date in W. Va. to be announced by the Spray Service.		Codling moth, curculio, scab, Brooks' spot, blotch, leaf spot.
(7) Ten weeks. Not recommended in the greater part of the area covered.		Codling moth, scab, sooty blotch, black rot, bitter rot, late caterpillars.
(8) Special blotch sprays.	Where blotch is serious, susceptible varieties should be sprayed with 2-4-50 Bordeaux at dates to be announced by the spray service of the various states.	

PEACHES

Time of Application.	Materials to Use.	For Control of.
(1) Dormant season (before buds have commenced to swell). February or early March.	Lime-sulphur 12 gal., water to make 100 gal.	Scale, leaf curl.
(2) Immediately after the petals drop.	Arsenate of lead 2 lb., freshly slaked lime 6 lb., water 100 gal.	Curculio.
(3) One week after No. 2.	Arsenate of lead 2 lb., freshly slaked lime 6 lb., water 100 gal.	Curculio.
(4) Three weeks after No. 3.	Arsenate of lead 2 lb., self-boiled lime-sulphur or dry-mix 100 gal.	Curculio, scab.
(5) One month before fruit ripens.	Self-boiled lime-sulphur or dry-mix.	Scab, brown rot.
(6) For late varieties only; 3 weeks after No. 5.	Self-boiled lime-sulphur or dry-mix.	Brown rot.

In the northern part of Virginia and in orchards which are damaged from early infection of brown rot, resulting in blighting of the blossoms and drying up and dropping of the small fruit, apply same materials as in spray No. 4 when pink begins to show in the bud. Early infection of brown rot is not prevalent generally over the state, but it occurs in parts of northern Virginia, particularly in Loudoun county. Unless blossom blight has been prevalent, follow the schedule as recommended in calendar above. No. 1 must be applied while the trees are absolutely dormant and before the bud scales begin to separate, if leaf curl is to be controlled, and the pink spray must go on before the petal spray.

If rose chafer should become serious, spray with arsenate of lead 8 lb., water 100 gal., to which 2 gal. of molasses are added. Application should be made when the bugs appear. Caution—This spray should not be used unless absolutely necessary, as severe burning may follow.

PLUMS

Time of Application.	Materials to Use.	For Control of.
(1) Dormant season.	Lime-sulphur 12 gal., water to make 100 gal.	Scale and general clean-up.
(2) As soon as petals fall.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.	Curculio, leaf spot.
(3) One week after No. 2.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.	Curculio, leaf spot.
(4) Three weeks after No. 3.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.	Curculio, leaf spot.
(5) One month before fruit ripens.	Self-boiled lime-sulphur.	Brown rot and other fungous diseases.

CHERRIES

Time of Application.	Materials to Use.	For Control of.
(1) Dormant season.	Lime-sulphur 12 gal., water to make 100 gal.	Scale.
(2) Immediately after petals fall.	For sour cherries, use lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal. For sweet cherries, use lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Leaf spot, curculio.
(3) One week after No. 2.	For sour cherries, use lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal. For sweet cherries, use lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Leaf spot, curculio.
(4) Three weeks after No. 3.	For sour cherries, use lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal. For sweet cherries, use lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Leaf spot, curculio, brown rot.
(5) Immediately after fruit is harvested.	For sour cherries, use lime-sulphur 3 gal., water to make 100 gal. For sweet cherries, use lime-sulphur 2½ gal., water to make 100 gal.	Leaf spot.

If rose bug should become serious, apply same treatment as recommended for peaches.

GRAPES

Time of Application.	Materials to Use.	For Control of.
(1) Dormant season.	Lime-sulphur 12 gal., water to make 100 gal.	Scale and general clean-up.
(2) When second or third leaf shows.	4-5-50 Bordeaux.	Anthracnose, bitter rot, black rot, mildew.
(3) Before blossoms open.	4-5-50 Bordeaux.	Anthracnose, bitter rot, black rot, mildew.
(4) After blossoms fall.	4-5-50 Bordeaux.	Anthracnose, bitter rot, black rot, mildew.
(5) Ten to 14 days later.	4-5-50 Bordeaux.	Anthracnose, bitter rot, black rot, mildew.
Thereafter at 2-week intervals until within 2 weeks of harvest time.	4-5-50 Bordeaux.	Anthracnose, bitter rot, black rot, mildew.

Arsenate of lead 4 lb. should be combined with 100 gal. Bordeaux if chewing insects make an appearance.

Burgundy mixture may be substituted for Bordeaux in the last spray in order to prevent discoloring of the fruit. The following formula is suggested:

Caustic soda	5 lb.
Copper sulphate	4 lb.
Water	50 gal.

Prepare and apply same as Bordeaux.

RASPBERRIES AND BLACKBERRIES

Anthracnose causes cankers on the canes of the raspberry and blackberry. It is the most important disease of the bush fruits in Virginia and can be effectively controlled by the application of two lime-sulphur sprays according to the following calendar. The addition of a casein spreader at the rate of 1 lb. to 100 gal. of spray material is necessary to secure control.

Time of Application.	Materials to Use.	For Control of.
(1) In spring just after growth begins.*	Lime-sulphur 11 gal., water to make 100 gal.	Anthracnose.
(2) One week before bloom.	Lime-sulphur 2 gal., water to make 100 gal.	Anthracnose.

*Spray No. 1 should be applied after growth begins but not after the leaves have reached ½ in. in length.

STRAWBERRIES

Time of Application.	Materials to Use.	For Control of.
(1) When growth begins.	4-5-50 Bordeaux.	Leaf spot.
(2) Before blossoming.	4-5-50 Bordeaux.	Leaf spot.
(3) Just after blossoming.	4-5-50 Bordeaux.	Leaf spot.
(4) After leaves have been mowed and burned.	Arsenate of lead 2 lb., 4-5-50 Bordeaux 100 gal.	Leaf spot, flea beetle.

Should leaf roller appear, or if it has been prevalent, add lead arsenate at rate recommended in No. 4 spray in each application.

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 32 degrees Baume.

Oil Emulsion—The engine oil emulsion recommended in the apple schedule is that made according to Missouri formula No. 2. In making the stock solution according to this formula, use engine oil 2 gal., water 1 gal., and Kayso (calcium caseinate) ¼ lb. First thin the Kayso with water, working it into a paste and adding the water gradually. Then add the oil. Agitate the material vigorously by pumping it through a hand sprayer until it is thoroughly emulsified. The resulting material is called the stock solution and should be diluted as indicated.

Self-Boiled Lime-Sulphur—For making 100 gal. self-boiled lime-sulphur, use 16 lb. fresh lump lime, 16 lb. ground sulphur, water to make 100 gal. Use only the best grade of lime. Place the lime in a barrel or vat and add a bucket of water to start slaking. When slaking is well started, sift in the sulphur and add more water gradually. Stir the lime and sulphur vigorously to prevent caking. Add water as needed to prevent drying or burning, but do not flush the mixture and cool it unnecessarily.

When the slaking is practically finished, wash the mixture immediately through a strainer to eliminate lumps. Add sufficient water to make 100 gal. Keep the material thoroughly agitated and apply in the freshest condition possible.

XUM

Spraying and Dusting Schedules for Michigan

By W C. Dutton, Michigan State College

In these schedules, recommendations are made for spraying and dusting. The value of the spraying treatments recommended have been well established, and satisfactory control may be expected if the materials are used at the proper strength, if they are properly mixed, and if the applications are made at the correct periods. The value of the dusting method has been well established for certain uses, but with some fruits the results have not always been satisfactory for such troubles as apple scab, cherry leaf spot or codling moth when conditions were favorable for their development and spread. Because of the many advantages of the dusting method, many growers prefer to use it for all or part of the applications, but it should be borne in mind that in bad years it is easier to get control with sprays than with dusts. Some growers use dust for the entire season; others spray for the early applications and dust later; and still others may use it in emergencies when it is not possible to cover the orchard at critical times with the available spraying equipment. With both dusting and spraying, the schedules are intended to cover rather severe conditions. Some growers may not find it necessary to make all the recommended applications, but under severe conditions even more may be necessary. Dry lime-sulphur may be substituted for the liquid on the basis of four pounds of the dry to one gallon of the liquid. Oil sprays are desirable in many ways, but their continued use is not now recommended.

APPLES

Time of Application.	Materials to Use — Spraying.	Dusting.	For Control of.	Remarks.
(1) Dormant. Apply as late as possible before growth starts, or—	Lime-sulphur 12½ gal., water to make 100 gal.	Use liquid spray, as dormant dusts cannot be recommended at present.	Scale insects.	The dormant may be used when spraying for scale only, otherwise use the delayed dormant. Oil sprays, either commercial or home-made, will give excellent control of scale and are necessary in case of leaf roller or red mite. They may also be expected to give control of aphids if applied thoroughly enough.
(1a) Delayed dormant. Begin when fruit buds show silvery and finish by time they are in "squirrel's ear" stage.	Lime-sulphur 12½ gal., nicotine sulphate 1 pint, water to make 100 gal.	Use liquid spray as recommended, except possibly for aphids. See application No. 2.	Scale insects, aphids.	
(2) Pre-pink. Apply about midway between delayed dormant stage and when buds begin to separate in the clusters.	Lime-sulphur 2½ gal., water to make 100 gal.	Sulphur dust. If dust is used for the rosy aphis, apply at this time, using not less than 2% nicotine.	Scab.	If bud moth is prevalent, add lead arsenate in this or the delayed dormant stage. Under bad scab conditions, make another application of dust between pre-pink and pink.
(3) Pink or cluster. Apply as soon as possible after the buds separate in the cluster.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal. If red bug is present, add 1 pint nicotine sulphate.	90-10 sulphur-lead dust. For red bug use nicotine dust 2%.	Scab, fruit worm, leaf roller and other chewing insects.	The use of lead arsenate at this time is not always necessary, but its use is good insurance.
(4) Calyx. As soon as most of petals have fallen.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal. If red bug is present, add nicotine sulphate 1 pint.	90-10 sulphur-lead dust from one side and repeat from other side in 1 week. Use dust containing 2% nicotine if red bug persists.	Scab, codling moth, curculio, fruit worm, red bug.	This application should not be delayed after petal fall because of danger from scab.
(5) Ten-days or 2-weeks. Should be completed in two weeks after calyx spray.	Lime-sulphur 2½ gal., arsenate of lead 2 to 3 lb., water to make 100 gal.	90-10 sulphur-lead dust from same side as in calyx spray. Repeat from other side in about 1 week.	Scab, codling moth, lesser fruit worm and other chewing insects.	Dry-mix sulphur-lime or a wettable sulphur may be substituted at this time or in later sprays for lime-sulphur.
(6) Thirty-day. Complete about 30 days after calyx spray.	Lime-sulphur 2 gal., arsenate of lead 3 lb., water to make 100 gal.	90-10 or 85-15 sulphur-lead dust applied as two half applications at 1-week intervals.	Codling moth, scab.	This application is not necessary in many districts, but is good insurance where codling moth is serious. The lime-sulphur may be omitted entirely unless scab is present.
(7) Second brood. Apply at time recommended by experiment station entomologist.	Lime-sulphur 2½ gal., arsenate of lead 3 lb., water to make 100 gal.	85-15 sulphur-lead dust applied as two half applications at 1 week intervals.	Codling moth, scab.	

PEARS

Time of Application.	Materials to Use — Spraying.	Dusting.	For Control of.	Remarks.
(1) Dormant. Apply as buds are beginning to swell, or—	Lime-sulphur 12½ gal., water to make 100 gal.	No dust available. Spray with lime-sulphur 12½ gal., water to make 100 gal.	Scale insects, blister mite.	If scale or blister mite only is present, the dormant will be satisfactory. When scab is also prevalent, use the delayed dormant, which will also kill many psylla eggs. If scab only is to be controlled, use Bordeaux or weak lime-sulphur for spraying or sulphur dust for dusting.
(1a) Delayed dormant. Apply after buds can be seen in the cluster, but must be completed before they separate.	Lime-sulphur 12½ gal., water to make 100 gal.; or 4-8-100 Bordeaux (see Remarks).	Lime-sulphur 12½ gal., water to make 100 gal.; or sulphur dust (see Remarks).	Scale insects, blister mite, scab, psylla eggs.	
(2) Pink or cluster. Apply when buds have separated in the clusters.	4-8-100 Bordeaux.	Sulphur dust.	Scab.	This application is not necessary in many parts of the state where pear scab is not prevalent.
(3) Calyx. Apply as soon as petals have dropped.	Nicotine sulphate 1 pint, lime 40 to 50 lb., 2-4-50 Bordeaux 100 gal.	90-10 sulphur-lead dust. For psylla use a 2 to 3% nicotine dust 7 to 9 days later.	Scab, codling moth, psylla.	If scab is not a factor, omit the Bordeaux but use the poison. If psylla is not present, omit the nicotine and excess lime from the spray or nicotine dust from the dust treatment. This applies for both the calyx and 2-weeks applications.
(4) Two-weeks. Apply 2 weeks after petals have fallen.	Nicotine sulphate 1 pint, lime 40 to 50 lb., 1-4-50 Bordeaux 100 gal.	90-10 sulphur-lead dust. For psylla use nicotine dust 2 to 3% 2 weeks after first nicotine dust treatment.	Scab, codling moth, psylla.	
(5) Second brood. Usually about first of August.	Arsenate of lead 3 lb., 1-4-50 Bordeaux 100 gal.	85-15 sulphur-lead dust.	Scab, codling moth.	When scab is not a factor, use only arsenate of lead with casein spreader.

Note—If psylla appears during mid or late summer, make extra applications of nicotine sulphate and lime as a spray or nicotine as a dust.

PEACHES

Time of Application.	Materials to Use — Spraying.	Dusting.	For Control of.	Remarks.
(1) Dormant. Apply in early spring before buds begin to swell.	Lime-sulphur 12½ gal., water to make 100 gal.	Spray with lime-sulphur 12½ gal., water to make 100 gal.	Leaf curl, scale insects.	This application must be made before growth starts to be fully effective. Fall application will usually give satisfactory results.
(2) After blossoms have dropped and most of "shucks" have fallen.	Arsenate of lead 2 lb., lime 8 to 10 lb., water 100 gal.	Lead arsenate-hydrated lime dust (10% arsenate of lead); or 80-10-10 sulphur lead-lime.	Curculio.	Arsenate of lead should never be used on peaches without lime. This applies for both dust and spray. Serious injury may follow if this precaution is not observed.
(3) Two-weeks. After "shucks" have fallen.	Dry-mix sulphur-lime 25 lb., arsenate of lead 2 lb., fresh hydrated lime 8 lb., water to make 100 gal.	80-10-10 sulphur-lead-lime dust.	Curculio, brown rot, scab.	
(4) One month before fruit ripens.	Dry-mix sulphur-lime 25 lb., arsenate of lead 2 lb., fresh hydrated lime 8 lb., water to make 100 gal.	80-10-10 sulphur-lead-lime dust.	Brown rot, scab, curculio.	This is important with many varieties for brown rot and scab. If curculio is not present the poison may be omitted as well as the excess lime.
(5) One week to 10 days before harvest.	Sulphur-casein spray or a wettable sulphur.	Sulphur-dust.	Brown rot.	This is especially valuable with many early varieties, or with any that are susceptible to rot, and in rainy, muggy weather.

GRAPES

Time of Application.	Materials to Use — Spraying.	Dusting.	For Control of.	Remarks.
(1) When shoots are 8 to 10 in. long.	8-8-100 Bordeaux.	Copper-lime dust containing 20% monohydrated copper sulphate.	Black rot, downy mildew.	
(2) Just before the blooming period	Arsenate of lead 3 lb., 4-4-50 Bordeaux 100 gal.	Copper-lime dust with 10 to 15% arsenate of lead.	Black rot, berry moth, downy mildew.	If rose chafer is prevalent, more arsenate may be necessary.
(3) Just as blossoms are falling.	Arsenate of lead 3 lb., 4-4-50 Bordeaux 100 gal.	Copper-lime dust with 10 to 15% arsenate of lead.	Black rot, berry moth, downy mildew.	A very important application.
(4) About two weeks after No. 3.	Arsenate of lead 2 lb., 4-4-50 Bordeaux 100 gal.	Copper-lime dust with 10 to 15% arsenate of lead.	Black rot, berry moth, mildew.	The necessity for the spray at this time will depend on conditions, but the dust should not be omitted, although the poison may sometimes be left out.
(5) Just before the berries touch in the clusters.	Arsenate of lead 2 lb. or more, resin fish-oil soap 2 lb., 4-4-50 Bordeaux 100 gal. Spray upward with short rod and angle nozzle.	Copper-lime dust with 10 to 15% arsenate of lead.	Black rot, berry moth, mildew.	This application is very important for berry moth. If hoppers are not present, the nicotine is not necessary. The hopper treatment may usually be made at this time but should be delayed if necessary until the oldest nymphs get wings. Do not delay the berry moth treatment later than indicated. The nicotine sulphate cannot be combined with copper-lime dust, but may be used immediately before or after.
	Nicotine sulphate 1 pint in 100 gal. of spray. Combine with No. 5 if possible. Otherwise make separate spray, using nicotine sulphate 1 pint, resin fish-oil soap 2 lb., water 100 gal.	Nicotine-lime dust 2%. This must be a separate application from the copper dust.	Leaf hoppers.	

(*Concluded on page* 12)

Spraying and Dusting Schedules for Michigan

(Continued from page 11)

CHERRIES AND PLUMS

Time of Application.	Materials to Use — Spraying.	Materials to Use — Dusting.	For Control of.	Remarks.
(1) Dormant. Apply just before growth starts.	Lime-sulphur 12½ gal., water to make 100 gal.	Spray, using lime-sulphur 12½ gal., water to make 100 gal.	Scale insects.	This is seldom necessary on sour cherries and not often on sweet.
(2) Petal-fall. Just after petals have dropped.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal. (For sweet cherries never use more than 2 gal.)	Copper-lime dust containing 20% monohydrated copper sulphate and 80% arsenate of lead; or 90-10 sulphur-lead dust.	Leaf spot, slug, brown rot, curculio.	Dry mix sulphur-lime spray 25 lb., water to make 100 gal., will usually be a satisfactory substitute for lime-sulphur on sweet cherries. This is unlikely to cause foliage injury. The dust applications should be split in halves and applied from opposite sides of the trees at weekly intervals.
(3) Two-weeks. Should be complete within 2 weeks after petal-fall.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.	Copper-lime dust with 10% arsenate of lead; or 90-10 sulphur-lead dust.	Leaf spot, brown rot, curculio, slugs.	
(4) When early Richmond cherries begin to show faint red color.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.	90-10 sulphur-lead dust.	Leaf spot, cherry maggot, curculio, slug, brown rot.	This and No. 5 are important for the control of the cherry maggot or fruit fly.
(5) When Montmorency cherries begin to show a faint red color.	Arsenate of lead 2½ lb., water to make 100 gal.	90-10 sulphur-lead dust.	Cherry fruit fly.	With sweet cherries (or sour cherries that are left for late harvest) extra applications of sulphur dust without poison are desirable to prevent brown rot injury.
(6) After harvest. Just after fruit is picked.	Lime-sulphur 3 gal., arsenate of lead 1 to 2 lb., water to make 100 gal.	90-10 sulphur-lead dust.	Leaf spot, slugs.	This is desirable to prevent late summer defoliation.

Plums—In general, plums are most often injured by leaf spot, brown rot and curculio and require the same type of treatment as cherries. If scale is present, make application No. 1 and follow with Nos. 2 and 3 about one month before harvest. The local prevalence of curculio should determine how many times arsenate of lead should be used. In general, poison in Nos. 2 and 3 is sufficient. Use lime-sulphur at the rate of 2½ gal. in 100 gal. of spray, except on Japanese plums, for which dry-mix sulphur-lime spray should be used as on peaches. The late application of sulphur dust just before harvest is often very valuable for the control of rot.

Cherry Aphids—If the black cherry aphid is present, use nicotine sulphate 1 pint, and soap 2 to 3 lb., to 100 gal. of water just before blossoming. Drench the trees. Repeat during the summer if necessary.

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 32 to 33 degrees Baume.

Spraying Schedule for New England

By Brooks D. Drain, Massachusetts Agricultural College

APPLES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Delayed dormant. Early spring as buds are breaking.	Lubricating oil emulsion 4 to 5 gal., water to make 100 gal. (3% actual oil); or lime-sulphur 12 gal., 40% nicotine sulphate ⅝ pint, water to make 100 gal.	San Jose scale, European red mite (eggs), aphis, blister mite.	Lubricating oil emulsion is cheaper than lime sulphur and is more efficient in controlling European red mite.
(2) Pre-pink. Before the clusters of blossom buds separate.	Lime-sulphur 2 gal., water to make 100 gal.	Apple scab.	Used on McIntosh and other varieties subject to scab. Very effective when weather conditions are bad at this season.
(3) Pink spray. As blossom buds begin to show pink.	Lime-sulphur 2 gal., arsenate of lead 3 lb., nicotine sulphate 1 pint, water to make 100 gal.	Red bug, scab, curculio, aphis, tent caterpillar, bud moth, brown tail moth, gypsy moth, canker worms.	In areas where the gypsy moth is troublesome, the amount of arsenate of lead is doubled. This is a very important spray in New England.
(4) Calyx. Within a week after the petals fall.	Lime-sulphur 2 gal., arsenate of lead 3 lb., nicotine sulphate 1 pint, water to make 100	Codling moth, curculio, scab, red bug, aphis, gypsy moth, skeletonizer.	Generally regarded as the most important single spray.
(5) About July 1.	Lime-sulphur 2 gal., arsenate of lead 3 lb., water to make 100 gal.	Railroad worm, Brooks spot, sooty fungus, scab, skeletonizer.	Especially important in the control of railroad worm. Special sprays a and b, noted below, are often substituted for this application where railroad worm has not been common.

NOTES

1. **Special Sprays.**—The following special sprays are sometimes applied in addition to those listed above, or one or more of them may be substituted for No. 5:

a. Where plum curculio is serious on apples, a spray of arsenate of lead 3 lb. to 100 gal. is applied a week or 10 days after the calyx spray. This is also effective against late emerging codling moth. If scab is developing, 2 gal. lime-sulphur is added.

b. In seasons or localities where sooty fungus is expected to be serious, a spray of lime-sulphur 2 gal. to 100 gal. is made about the last of July or 2 months after the calyx spray.

2. Dry lime-sulphur is being commonly used by small growers because of its convenience in handling.

3. Dust is not very generally used with apples in New England.

PEACHES

Time of Application	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. In late autumn or early spring before buds begin to swell in the least.	Lime-sulphur 7 gal., water to make 100 gal.	Leaf curl.	If San Jose scale is present, use 12 gal. lime-sulphur instead of 7.
(2) When blossoms show pink.	Dry-mix sulphur lime 25 lb., water to make 100 gal.; or 16-16-100 self-boiled lime-sulphur.	Brown rot.	Sulphur dust may be used for this application.
(3) When the shucks are falling.	Same as No. 2, together with 3 lb. arsenate of lead.	Brown rot, curculio, scab.	The most important single spray. Sulphur-arsenate of lead dust may be used.
(4) Ten days or 2 weeks after No. 3.	Same as No. 3.	Curculio, scab, brown rot.	Sulphur-arsenate of lead dust, 85 to 15, may be used.
(5) Three or 4 weeks after No. 4.	Dry-mix sulphur lime 25 lb., water to make 100 gal.; or 16-16-100 self-boiled lime-sulphur.	Brown rot, scab.	Should not be used on early ripening varieties. Sulphur dust may be used.

PEARS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Cluster bud spray. As the blossom buds are separating in the cluster.	Lime-sulphur 12 gal., water to make 100 gal.	Psylla (eggs), San Jose scale, scab, blister mite.	Very important in psylla control.
(2) Calyx spray. Just after petals fall.	Quick lime 40 lb., copper sulphate 2 lb., arsenate of lead 3 lb., nicotine sulphate 1 pint, water to make 100 gal.	Codling moth, scab, psylla, curculio, leaf spot, false tarnished plant bug.	Most important single spray.
(3) Three to 5 weeks after calyx spray.	Quick lime 40 lb., copper sulphate 2 lb., arsenate of lead 3 lb., nicotine sulphate 1 pint, water to make 100 gal.	Psylla, scab, sooty fungus, codling moth, other leaf-eating insects and fungous diseases.	

SPECIAL SPRAYS

1. A special spray should be applied for blister mites when they are abundant. Use the same materials as for the cluster bud spray and apply before the buds break. Miscible oil is sometimes used in place of lime-sulphur when European red mite eggs are present.

2. An emergency spray for psylla to be applied when the nymphs become abundant. This is likely to occur almost any time during the growing season. Use same materials as for calyx spray.

PLUMS (Japanese Varieties)

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Just as shucks begin to fall.	Dry-mix sulphur lime 25 lb., arsenate of lead 3 lb., water to make 100 gal.; or arsenate of lead 3 lb., 8-8-50 self-boiled lime-sulphur 100 gal.	Brown rot, curculio, leaf spot.	Sulphur-arsenate of lead dust may be used.
(2) Ten days to 2 weeks after No. 1.	Dry-mix sulphur lime 25 lb., arsenate of lead 3 lb., water to make 100 gal.; or arsenate of lead 3 lb., 8-8-50 self-boiled lime-sulphur 100 gal.	Curculio, brown rot, leaf spot, skeletonizer, mildew.	Important in curculio control.
(3) About July 1.	Dry-mix sulphur lime 25 lb., arsenate of lead 3 lb., water to make 100 gal.; or arsenate of lead 3 lb., 8-8-50 self-boiled lime-sulphur 100 gal.	Curculio, brown rot, leaf spot, skeletonizer, mildew.	
(4) Two to 4 weeks after No. 3.	Dry-mix sulphur lime 25 lb., water to make 100 gal.; or 16-16-100 self-boiled lime-sulphur.	Brown rot, leaf spot, mildew.	Should not be used on early ripening varieties.

NOTES

1. If European red mite eggs and San Jose scale are present, a special spray of lubricating oil emulsion 4 to 5 gal. to 100 gal. of water should be applied when the trees are dormant.

2. Lime-sulphur 2 gal. to 100 gal. of water may be substituted in place of the dry-mix or self-boiled lime-sulphur with European varieties of plums.

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 33 degrees Baume.

Oil Emulsion—The directions for oil emulsions are based on the use of the government formulas.

THE WORK of the Minnesota Agricultural Experiment Station in developing raspberries and plums adapted to that northern climate is well known. Similar experiments are now in progress with grapes, according to W. H. Alderman, chief of the Division of Horticulture of the state university. Fruit breeders have crossed the hardy Alpha and Beta grapes grown in Minnesota with the sweet varieties of the East. Two crosses have already been secured which are particularly promising.

A real opportunity exists for grape growing in Minnesota, according to Prof. Alderman. The demand for Beta grapes is exceeding the supply. The Beta is better than the sweet grape for the production of unfermented juice. It is expected that the development of improved varieties will raise Minnesota to an important place in the rank of grape growing states.

XUM

Results

against the double problem of pest control and spray residue

BETWEEN the necessity of controlling the pests and the insistent objection to spray residue, the grower has a serious double problem to meet in 1927.

This is especially true in the apple and pear sections, where efforts to control codling moth have led to so many applications of arsenate of lead that the spray residue left on the fruit has become as big a problem as the pests themselves.

Spray residue is not easy to remove, to say nothing of the cost, trouble, and extra handling of the fruit (which is never desirable).

The simplest solution to the problem is the use of a non-objectionable spray instead of the objectionable material. Real progress has already been made along this line by the use of VOLCK, a harmless and non-objectionable oil spray of a unique and highly improved type, which combines high killing effectiveness with a margin of safety heretofore unknown in the field of contact sprays.

Controls Codling Moth

Partial or complete substitution of this material for arsenate of lead is rapidly gaining ground in the Pacific Northwest, California, and other fruit-growing sections, where the prevalence of codling moth has made the double problem of pest control and spray residue particularly acute.

Many growers this season will use VOLCK alone on pears and certain varieties of apples, where experience has shown that this plan gives real control of the pests and ends the problem of spray residue by eliminating the objectionable material from the spray program altogether.

Other growers will reduce the amount of lead put onto the fruit by adding VOLCK to the spray. This gives better results with fewer applications because VOLCK kills the eggs as well as the worms, thus adding greatly to the control effectiveness of each application. Most growers familiar with the material and its results will use VOLCK alone for late-season spraying, even where arsenate of lead is used earlier.

Kills Both Eggs and Worms

VOLCK controls codling moth by killing both eggs and worms. It also acts as a repellent for some days in preventing the moths from further laying on the sprayed trees. Thorough application and proper timing afford real crop protection, reduce wormy fruit to the minimum, and practically eliminate stings.

VOLCK is not only highly effective against codling moth, but has given excellent results against Peach Cottony Scale, Pear Psylla, Red Spider, San Jose Scale, and many other varieties of insect pests. It is really the only safe and successful summer spray for scale, not only killing the scale, but cleaning the fruit. The scale blemishes disappear and you get clean, smooth, fancy apples instead of dirty scaley fruit that is hard to market at any price.

Safe for the Trees

VOLCK does not carry the old hazard to fruit and foliage that once made summer application of oil sprays impracticable. It is distinctly a summer spray and is widely used throughout the growing season so that a radical improvement in methods of controlling insect pests has been made possible.

Where growers find it difficult to get satisfactory control of insect pests, where spray residue is causing trouble, or where both problems demand solution, growers should get the facts about this better method of pest control. Every grower should spray at least a part of his orchard with VOLCK this season either alone or in combination with arsenate of lead (with spreader) where results can be watched at first hand.

"My crop packed out the cleanest and smoothest that I have had in years and according to the packing-house manager, was one of the finest he handled," writes J. L. Maloney of Yakima, Wash. "I am convinced that VOLCK will control both scale and codling moth, and I intend using a straight VOLCK program on my pears this season."

R. P. Dempster, Granger, Wash., says, "A small block of Delicious bore a good crop last year, but I packed out only 46 boxes. This year I used VOLCK and packed out 331 boxes, of which 223 were Fancy and Extra Fancy. I know that VOLCK kills the eggs, as I watched quite a few with a microscope, and they never hatched out."

Write for interesting new booklet by Dr. W. S. Regan on "Results of Different Insecticidal Treatments on Control of Codling Moth."

CALIFORNIA SPRAY-CHEMICAL CO.

WATSONVILLE, CALIFORNIA

ALSO NEW YORK CITY; YAKIMA, WASHINGTON; PORTLAND, OREGON

New York, 204 Franklin St., Chicago, Ill., 11 East Austin St.; Portland, Ore., 419 Board of Trade Bldg.; Yakima, Wash., 207 Holtzinger Bldg.; Orlando, Fla., 61 West Jefferson St.; Watsonville, Calif., 135 Walker St.; Sacramento, Calif., 11th and R Sts.; San Jose, Calif., Bassett & Terraine Sts.; Los Angeles, Calif., 736 Standard Oil Bldg.

VOLCK

.. the Scientific Insecticide

Spray Calendar for the Middle West

By T. J. Talbert, University of Missouri

APPLES, PEARS AND QUINCES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant or delayed dormant. Generally most satisfactory just as blossom buds are swelling in spring.	Lime-sulphur 14 gal., water to make 100 gal.; or cold or boiled lubricating oil emulsion 3 gal., water to make 100 gal.	San Jose scale and other scale insects.	Proprietary miscible oils should be used at dilution recommended by manufacturers.
Special spray. When buds are opening and aphid eggs are hatching.	Oil emulsion 3 gal., water to make 100 gal.	Plant lice (aphids), San Jose scale.	Effective against aphids and scale. Apply before blossoms open.
(2) Cluster bud spray. When buds begin to separate but before they open.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.; or 3-4-50 Bordeaux 100 gal., arsenate of lead 2 lb.	Apple scab, leaf spot, curculio, canker worm.	Add 1 to 1½ pints nicotine sulphate when aphids are serious.
(3) Second summer or calyx spray. Start when bloom is two-thirds off and finish before the blossom ends close.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Codling moth, plant lice (aphids), curculio, canker worm, apple scab, black rot, leaf spot.	Most important summer spray. Should be applied within a week after petals fall to be most effective.
(4) Third summer spray. Within 12 or 14 days after calyx spray.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Apple blotch, curculio, codling moth, lesser apple worm, apple scab, leaf spot, phoma spot.	Where apple blotch or phoma spot is serious, use 3-4-50 Bordeaux instead of lime-sulphur.
(5) Fourth summer spray. Twelve to 14 days after No. 4.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Apple blotch, curculio, codling moth, lesser apple worm, apple scab, leaf spot, phoma spot, sooty blotch.	Where apple blotch or phoma spot is serious, use 3-4-50 Bordeaux instead of lime-sulphur.
(6) Fifth summer spray. Twelve to 14 days after No. 5.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Apple blotch, curculio, codling moth, lesser apple worm, apple scab, leaf spot, phoma spot, sooty blotch, bitter rot.	Where apple blotch or phoma spot is serious, use 3-4-50 Bordeaux instead of lime-sulphur.
(7) Sixth summer spray. Twelve to 14 days after No. 6.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.	Apple blotch, curculio, codling moth, lesser apple worm, apple scab, leaf spot, phoma spot, sooty blotch, bitter rot.	Make later sprays at intervals of 12-14 days when required for codling moth or bitter rot.

Dusting—Comparatively few growers are now using dusts in apple orchards because experience and observations have generally shown that where either diseases or insects are serious, liquid sprays usually give better results. Nevertheless, there has recently been a revival of interest in dusts in the central states. The best that the Missouri Agricultural Experiment Station can say at this time, however, is that dusts may profitably supplement liquid sprays in orchards large enough to justify the purchase of both liquid and dust sprayers. The dust applications may be made quickly between liquid applications and thus will tend to lessen the damage from both insects and diseases. It would be a serious mistake for the grower to rely wholly upon dusts. The dormant sprays must consist of a liquid application, and where apple blotch is serious, dusts have not as yet proved nearly as effective as Bordeaux.

GRAPES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. A few weeks before growth starts in the spring.	Lime-sulphur 14 gal., water to make 100 gal.	Grape scale, San Jose scale, anthracnose, black rot.	If scale is absent, use 8-8-100 Bordeaux for anthracnose and black rot.
Special bud spray. As buds are swelling.	Arsenate of lead 6 lb., lime 8 lb., water 100 gal.	Grape flea beetle.	If flea beetles are serious, repeat the spray in 5 to 7 days.
(2) First summer spray. When shoots are showing second or third leaf.	3-4-50 Bordeaux 100 gal., arsenate of lead 6 lb.	Black rot, anthracnose, flea beetle, rose chafer, curculio.	Lime-sulphur solution is not used as a spray for grapes on account of the injury it may do to fruit and foliage.
(3) Second summer spray. Just before blossoms open.	3-4-50 Bordeaux 100 gal., arsenate of lead 4 lb.	Black rot, anthracnose, curculio, flea beetle, berry moth, rose chafer.	For grape climbing cut worm, use poison bran mash sowing it broadcast on ground under vines in evening.
(4) Third summer spray. About 10 to 12 days after No. 3. or when the bloom is off.	3-4-50 Bordeaux 100 gal., arsenate of lead 4 lb.	Black rot, anthracnose, downy mildew, powdery mildew, curculio.	Thorough spraying and timely applications are required in successful grape culture.
(5) Fourth summer spray. About 10 to 14 days after No. 4.	3-4-50 Bordeaux 100 gal., arsenate of lead 4 lb.	Black rot, anthracnose, downy mildew, powdery mildew, curculio, grape root worm.	Perhaps more beginners in grape growing fail on account of improper spraying than from all other causes.
(6) Fifth summer spray. About 10 to 14 days after No. 5.	3-4-50 Bordeaux 100 gal., arsenate of lead 4 lb.	Black rot, anthracnose, downy mildew, powdery mildew, curculio, grape root worm.	It is important that spraying be discontinued at 4 to 6 weeks before harvest, otherwise the fruit may be badly stained.
(7) Sixth summer spray. About 10 to 14 days after No. 6.	3-4-50 Bordeaux 100 gal., arsenate of lead 4 lb.	Black rot, anthracnose, downy mildew, powdery mildew, curculio, grape root worm.	In vineyards where diseases and insects are not serious, three or four of the earlier sprays may be sufficient.

SOUR CHERRIES AND AMERICAN PLUMS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Just before the buds swell in the spring.	Lime-sulphur 14 gal., water to make 100 gal.; or cold or boiled lubricating oil emulsion 3 gal., water to make 100 gal.	San Jose scale, cherry scale.	When scale is absent, the dormant spray may be omitted.
(2) First summer spray. Just before the blossom buds open.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.; or 3-4-50 Bordeaux 100 gal., arsenate of lead 2 lb.	Curculio, brown rot, leaf spot.	Lime-sulphur does less injury and gives a much better finish to the appearance of the fruit and foliage.
(3) Second summer spray. As the husks or calyces fall.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.; or 3-4-50 Bordeaux 100 gal., arsenate of lead 2 lb.	Curculio, brown rot, leaf spot.	Bordeaux may give better control of leaf spot during wet seasons.
(4) Third summer spray. About 10 to 12 days after No. 3.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.; or 3-4-50 Bordeaux 100 gal., arsenate of lead 2 lb.	Curculio, brown rot, leaf spot.	A less number or additional sprays may be required depending on the severity of the diseases, curculio, and the weather.
(5) Fourth summer spray. Soon after harvesting the fruit.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.; or 3-4-50 Bordeaux 100 gal., arsenate of lead 2 lb.	Leaf spot, leaf eating insects.	For Japanese plums like Burbank, Abundance, Chebot, etc., use peach spray in same proportions, as it is less likely to do injury to fruit and foliage.

PEACHES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Any time after the leaves drop in the fall and before the buds swell in the spring.	Lime-sulphur 14 gal., water to make 100 gal.; or cold or boiled lubricating oil emulsion 3 gal., 3-4-50 Bordeaux to make 100 gal.	San Jose scale, other scale insects, peach leaf curl.	When scale is absent, use 3-4-50 Bordeaux or lime-sulphur 5 gal., water to make 100 gal., for control of peach leaf curl. Apply before buds start.
(2) First summer spray. As the husks or calyces fall, usually about 4 to 7 days after the bloom drops.	Dry-mix sulphur lime 25 lb., arsenate of lead 2 lb., water 100 gal.; or 8-8-50 self-boiled lime-sulphur 100 gal., arsenate of lead 2 lb.	Curculio, brown rot.	Where brown rot is not serious, very good results may be had from spray made from 8 lb. lime and 2 lb. arsenate of lead to 100 gal. water.
(3) Second summer spray. About 10 to 12 days after No. 2.	Dry-mix sulphur lime 25 lb., arsenate of lead 2 lb., water 100 gal.; or 8-8-50 self-boiled lime-sulphur 100 gal., arsenate of lead 2 lb.	Scab, brown rot, curculio.	Dry-mix sulphur lime is generally the most satisfactory spray for peaches.
(4) Third summer spray. About 10 to 12 days after No. 3.	Dry-mix sulphur lime 25 lb., arsenate of lead 2 lb., water 100 gal.; or 8-8-50 self-boiled lime-sulphur 100 gal., arsenate of lead 2 lb.	Scab, brown rot, curculio.	Where scale and leaf curl are absent, sprays Nos. 2 and 3 will often be sufficient for early peaches. Varieties like Elberta, Heath Cling and Krummel may require two or three additional sprays made at intervals of about 10 to 12 days.
(5) Fourth summer spray. About 10 to 12 days after No. 4.	Dry-mix sulphur lime 25 lb., arsenate of lead 2 lb., water 100 gal.; or 8-8-50 self-boiled lime-sulphur 100 gal., arsenate of lead 2 lb.	Scab, brown rot, curculio.	During rainy seasons additional sprays may be required.

DUSTING PROGRAM FOR PEACHES, CHERRIES AND PLUMS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Dust is not advised. Use liquid sprays suggested.	Lime-sulphur 14 gal., water to make 100 gal.; or cold or boiled lubricating oil emulsion 3 gal., 3-4-50 Bordeaux to make 100 gal.	San Jose scale, cherry scale, other scale insects, peach leaf curl.	When scale is absent use 3-4-50 Bordeaux, or lime-sulphur 5 gal., water to make 100 gal., for peach leaf curl. Apply before growth starts.
(2) First summer spray. When about 75% of the petals have fallen.	95-5 sulphur-lead arsenate dust.	Curculio, brown rot, cherry leaf spot.	Only the finely ground and specially prepared sulphur and arsenicals are satisfactory as dust sprays.
(3) Second summer spray. When calyces or shucks are shedding or about 4 to 7 days after the blossoms drop.	95-5 sulphur-lead arsenate dust.	Curculio, brown rot, peach scab, cherry leaf spot.	Commercial concerns handle machines, equipment and materials suitable for applying dust sprays.
Special spray. About 7 days after No. 3.	95-5 sulphur-lead arsenate dust.	Curculio, brown rot, peach scab, cherry leaf spot.	This spray is not required unless curculio is serious.
(4) Third summer spray. About 10 to 12 days after No. 3.	95-5 sulphur-lead arsenate dust.	Curculio, brown rot, peach scab, cherry leaf spot.	Dust sprays are in general more satisfactory for stone fruits than for apples. This is particularly true for the peach.
(5) Fourth summer spray. About 10 to 12 days after No. 4.	95-5 sulphur-lead arsenate dust.	Curculio, brown rot, peach scab, cherry leaf spot.	Additional dust sprays at intervals of 10 to 12 days may be needed until withing about 3 weeks of harvest.

LUBRICATING OIL EMULSIONS

Oil emulsions have been used in Missouri for 4 years as dormant sprays for San Jose scale control. They are not recommended as foliage or fruit sprays. When directions for preparing, diluting and applying oil emulsions as a dormant spray are strictly followed, we believe that they are effective in controlling scale. Two per cent of oil is the strength recommended as a dormant spray. Remember also that free oil, which may rise out of an improper emulsion, or from the diluted spray mixture, is liable to cause injury to fruit trees. If free oil does rise, the emulsion is not safe to use. Consult Missouri Experiment Station Circular 109 and Bulletin 216 on preparing oil emulsions. Do not spray free oil on trees. For best results, a good emulsion must be maintained at all times. Lubricating oil emulsion is not fool-proof, but, if properly prepared and applied when weather conditions are favorable for dormant spraying, experience to date shows it to be safe. This also applies to the commercial oil emulsions and miscible oils on the market.

POINTS TO BE REMEMBERED

The lubricating oil emulsions are not recommended as fungicides. There is no evidence that they have any fungicidal value. When mixed with Bordeaux 3-4-50, however, the combination spray becomes a fungicide as well as an insecticide.

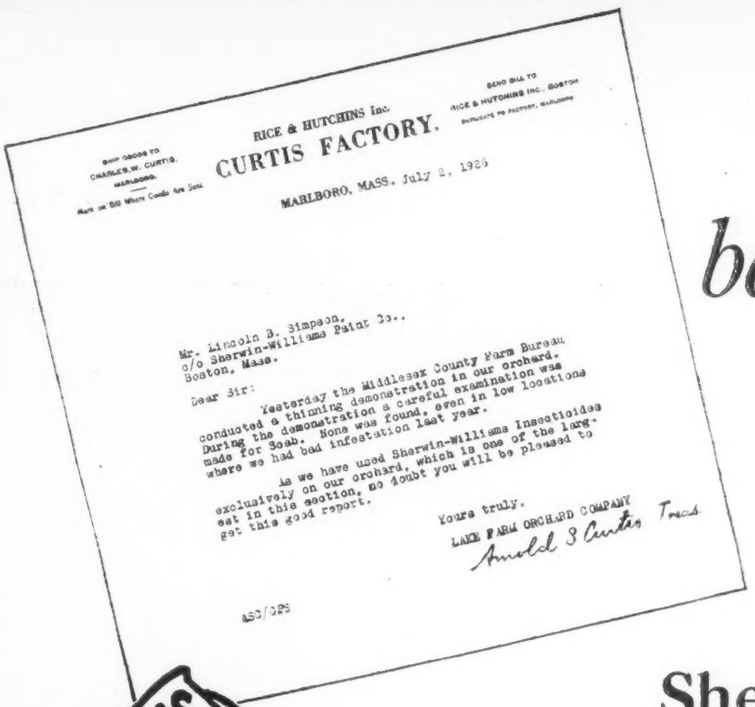
1. For the effective control of scale, liquid lime-sulphur, the lubricating oil emulsions, or miscible oils may be used. If there is any slight advantage in the matter of scale control, it is on the side of the oils.
2. From the standpoint of scale alone, the lubricating oil emulsion sprays are the cheaper.
3. From the point of view of possible injury to the fruit trees, lime-sulphur has a decided advantage, as it has never caused injury when applied on dormant trees. However, the oil emulsions are being used extensively for dormant sprays, and if the emulsions are properly prepared and diluted, evidence to date indicates that they can be safely used on dormant trees.
4. Use Bordeaux 3-4-50 with every tank of engine oil-soap emulsion. Stock emulsions in which free oil has separated out and come to the surface, due to freezing or any other cause, should not be used. Do not use a dilute spray mixture in which free oil has separated out and come to the surface of the tank. Stir all stock emulsions before measuring out for use. If you make your own emulsions, follow directions carefully, especially instructions to use a pump giving good pressure. The pressure given by a hand pump can usually be increased by decreasing the size of the opening of the nozzle.
5. Careful experiments and observations in Missouri have shown that San Jose scale can be effectively controlled with lime-sulphur, lubricating oil emulsions and proprietary miscible oils. A very thorough application is necessary and each spray must be used at the proper dilution. As many growers have failed to control scale with the oil sprays as with the lime-sulphur spray. It is not, therefore, so much a matter of which spray to use as it is of thorough spraying at the right dilution. One good dormant application each year should keep the scale well under control and prevent injury to the fruit and trees.

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 33 to 34 degrees Baume.

SHERWIN-WILLIAMS



RICE & HUTCHINS Inc.
CURTIS FACTORY.
MARLBORO, MASS. July 2, 1926

Mr. Lincoln B. Simpson,
c/o Sherwin-Williams Paint Co.,
Boston, Mass.

Dear Sir:

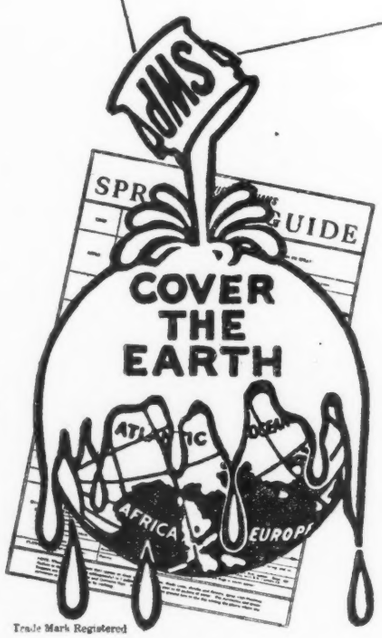
Yesterday the Middlesex County Farm Bureau conducted a thinning demonstration in our orchard. During the demonstration a careful examination was made for Scab. None was found, even in low locations where we had bad infestation last year.

As we have used Sherwin-Williams Insecticides exclusively on our orchard, which is one of the large- est in this section, no doubt you will be pleased to get this good report.

Yours truly,
LAKE FARM ORCHARD COMPANY
Arnold S Curtis, Treas

ASC/DPS

"Last year– *bad infestation,* this year– *none*"



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SPRAY MATERIALS

Spray Table for Northern California

By A. H. Hendrickson, University of California

(Table summarized from Circular 265, California Agricultural Experiment Station.)

ALMONDS

For Control of.	Treatment.	Time of Application.	Remarks.
Shot hole.	Lime-sulphur 10 gal., water to make 100 gal.	Just as buds are swelling.	
Red spider.	(1) Lime-sulphur 10 gal., water to make 100 gal. (2) Dust with dry sulphur; or spray with lime-sulphur 2 gal., water to make 100 gal., or with sulphur paste 8 to 21 lb., water 100 gal.	(1) During dormant season. (2) As soon as mites appear and as often as necessary during the summer.	(1) To kill eggs of Bryobia, oil emulsion also used. (2) To kill adults of tetranychus. Summer oils used to some extent.
California peach borer.	See under peaches.		
Peach twig borer.	See under peaches.		
Red humped caterpillar.	See under prunes.		

APPLES

For Control of.	Treatment.	Time of Application.	Remarks.
Pear blight.	See under pears.		
Mildew.	Lime-sulphur 3 gal., water to make 100 gal.; or sulphur paste 8 lb., water 100 gal.	When petals fall. Several times during spring.	Apple trees injured by sulphur sprays in some sections. Careful pruning of diseased twigs aids in control. Consult county agent when disease is severe.
Scab.	(1) 4-5-50 Bordeaux; or lime-sulphur 5 gal.; water to make 100 gal. (2) Lime-sulphur 3 gal., water to make 100 gal.	(1) As winter buds open. (2) As petals fall.	Later sprays necessary in coastal region.
Codling moth.	(1) Arsenate of lead 2½ lb., water 100 gal. (2) Same as No. 1. (3) Same as No. 1.	(1) As petals fall. (2) Three weeks later. (3) As needed.	In many sections 2 sprays are sufficient. The calyx spray is most important. In other sections 4 to 7 sprays may be necessary. Clean up around packing houses.
Flat headed apple tree borer.	Soap naphthalene repellant.	Early spring.	Whitewashing young trees helpful.
Leaf roller.	Miscible oil according to manufacturers' directions; or oil emulsion cording to government formulas.	Dormant season.	To kill eggs drench trees thoroughly.
Green and rosy apple aphis.	(1) Lime-sulphur 10 gal., water to make 100 gal. (2) Nicotine sulphate 1 pint, fish-oil soap 5 lb., water 100 gal. (3) Five or 6% nicodust.	(1) Late dormant. Just before buds open. (2) From bursting of buds until leaf buds are ½ in. long. (3) Same as No. 2.	(1) Fair results in killing eggs. (2) Results in somewhat better control than No. 1. (3) Material must be fresh and up to strength.
Red humped caterpillar.	See under prunes.		
Scale insects.	Lime-sulphur 10 gal., water to make 100 gal.; or crude, lubricating, or distillate oil emulsion.	Dormant season after first heavy rains.	Lime-sulphur is sufficient for San Jose scale. Some others require heavy oil emulsions.
Tussock moth.	Sprays ineffective.		Destroy egg masses in winter, band trees with Tanglefoot to prevent caterpillars from climbing trees.
Woolly apple aphis.	Distillate emulsion or miscible oil. P. D. B. in 2 rings around trees in fall for root form.	Winter months. September-October	Delicious and Northern Spy nearly immune. Use refuse tobacco stems around roots.

APRICOTS

For Control of.	Treatment.	Time of Application.	Remarks.
Bacterial gummosis.	Cut out diseased bark and disinfect as with pear blight.	After first fall rains.	Summer treatment of doubtful value. Inspect orchard at frequent intervals during winter.
Brown rot.	(1) 8-8-50 Bordeaux (2) 4-4-50 Bordeaux.	(1) Red bud stage. (2) Up to full bloom.	Cut out diseased twigs in winter. Remove fruit mummies. Avoid sulphur sprays on apricots.
Shot hole.	(1) 5-5-50 Bordeaux. (2) 5-5-50 Bordeaux. (3) 2-2-50 Bordeaux.	(1) Nov. 15 to Dec. 15. (2) Red bud stage, or (3) When jackets drop.	Spraying must be done thoroughly.
California peach borer.	P. D. B.	September-October	Soil should be warm for best results.
Leaf roller.	See under apples.		
Brown apricot and black scales.	Crude or distillate oil emulsion or miscible oil.	December to February.	Should not be applied until after first heavy winter rains. Cover new growth thoroughly.
Peach twig borer.	See under peaches.		
Red humped caterpillar.	See under prunes.		

CHERRIES

For Control of.	Treatment.	Time of Application.	Remarks.
Bacterial gummosis.	See under apricots.		Topwork on Mazzard seedlings.
Leaf and fruit spot (shot hole).	See under apricots.		
Black cherry aphis.	Spray with nicotine-sulphate 1 pint, fish-oil soap 4 or 5 lb., water 100 gal.; or dust with 5% nicodust.	As soon as aphids appear.	
Cherry fruit sawfly.	Basic arsenate of lead 3 lb., water 100 gal.	When petals are opening.	
Cherry slug.	(1) Basic arsenate of lead 3 lb., water 100 gal. (2) 2 to 5% nicodust.	When slugs appear.	May also be controlled with hydrated lime or even dry road dust.
Pear thrips.	See under pears.		
Red humped caterpillar.	See under prunes.		

FIGS

For Control of.	Treatment.	Time of Application.	Remarks.
Smut.	Remedy unknown.		
Souring and splitting.	Probably due to unfavorable climatic or soil moisture conditions.		
Mediterranean fig scale.	Distillate or crude oil emulsion or miscible oil.	Dormant season.	

GRAPES

For Control of.	Treatment.	Time of Application.	Remarks.
Grape mildew.	Finest forms of dry sulphur.	When new shoots are 6 in. long and just before blossoms open.	In cool or moist locations, a third application when berries are as large as peas and a fourth when fruit is two-thirds grown may be necessary.
California grape root worm.	Spray with arsenate of lead 3 lb., water 100 gal.; or dust with arsenate of lead 20%, hydrated lime 80%.	As soon as beetles appear in spring.	Cultivate close to vines in winter to kill larvae.
Grape leaf hopper.	(1) Nicotine sulphate 1 lb., liquid soap ½ gal. (or hard soap 1 lb.), water 100 gal. (2) 50% calcium cyanide dust; or 10% nicodust; or 6% nicosulphur.	(1) Before nymphs develop wings. (2) When adults appear.	The nicosulphur will help control mildew.
Phylloxera.	Use resistant vines. Disinfect cuttings or rootings before planting by dipping in hot water (122 degrees F.) for 5 minutes.		P. D. B. seems promising.
Mealy bug.	Difficult to control. Best results obtained by burning sulphur under tent over vines.		

OLIVES

For Control of.	Treatment.	Time of Application.	Remarks.
Olive knot.	Cut out thoroughly at first appearance and disinfect.		
Black scale.	Distillate or lubricating oil emulsion.	December to February.	

PEACHES

For Control of.	Treatment.	Time of Application.	Remarks.
Peach blight, peach leaf curl.	(1) 5-5-50 Bordeaux. (2) 5-5-50 Bordeaux; or lime-sulphur 10 gal., water to make 100 gal.	(1) After first fall rains. Nov. 15 to Dec. 15. (2) As buds show green in spring.	(1) Fall spray important for blight, spring spray for curl. (2) Add 3 lb. basic lead arsenate powder to 100 gal. of Bordeaux for control of twig borer.
Brown rot.	See under apricots.		
Mildew.	Dust with dry sulphur.	Dust at first indication.	
Black peach aphis.	Nicotine sulphate 1 pint, fish-oil soap 5 lb., water 100 gal.	As soon as insects appear.	5% nicodust may also be used.
Black scale, brown apricot scale.	See under apricots.		
Flat headed apple tree borer.	See under apples.		
Peach rust mite.	Lime-sulphur 10 gal., water to make 100 gal.	Dormant season.	
California peach root borer.	Apply 1 to 1½ oz. P. D. B. per tree at base about 3 in. from trunk and mound with earth.	September-October.	Soil should be about 55 degrees F. for best results.
Peach twig borer.	(1) Basic arsenate of lead 3 lb., 5-5-50 Bordeaux 100 gal.; or lime-sulphur 10 gal., basic arsenate of lead 3 lb., water to make 100 gal. (2) Nicotine sulphate 1 pint, water 100 gal., to be used alone if other diseases are not present. Basic arsenate of lead 3 lb., water 100 gal.	Pink bud stage. Before harvest.	Clean up around packing house. Burn old prunings. Spray must cover all young growth.
Red spider.	See under almonds.		
San Jose scale.	See under apples.	December to February.	

PLUMS AND PRUNES

For Control of.	Treatment.	Time of Application.	Remarks.
Brown rot.	See under apricots.		Sometimes serious on sugar prunes.
Scale insects.	See under apples and apricots.		Italian pear scale often troublesome.
Cherry fruit sawfly.	See under cherries.		
Flat headed apple tree borer.	See under apples.		Often serious on young trees.
Fruit tree leaf roller.	See under apples.		
Mealy plum louse.	Fish-oil soap 3 lb., water 100 gal.	When insects appear.	Spraying must be done before leaves curl.
Peach twig borer.	See under peaches.		
Pear thrips.	See under pears.		
Red humped caterpillar.	Basic arsenate of lead 5 lb., water 100 gal.	Whenever insects appear. Young caterpillars killed more easily than old ones.	Difficult to control. "Acid lead" generally unsafe on prune foliage.
Tussock moth.	See under apples.		

PEARS

For Control of.	Treatment.	Time of Application.	Remarks.
Black end.	No remedy known.		Seems to be associated with Japanese rootstocks.
Pear blight.	Spraying ineffective. Cut out affected parts. Remove holdover cankers in large branches, trunk and roots during winter. Disinfect tools and cuts with mercuric chloride and mercuric cyanide 1 part each to 500 of solution consisting of 1 part water and 3 parts glycerine. Scarification followed by disinfection successful in many cases.		Avoid stimulating rank growth. Topwork on resistant varieties. Inspect orchard frequently during spring and fall.
Scale insects.	See under apricots.		
Pear slug.	See under cherries.		
Codling moth.	See under apples.		
Fruit tree roller, green apple aphis.	See under apples.		
Italian pear scale.	Crude oil emulsion.	January or February.	Drench branches and trunk.
Pear leaf blister mite.	Lime-sulphur 10 gal., water to make 100 gal.	November or February.	The November spray is successful in many sections.
Pear root aphis.	P. D. B.	Fall.	Japanese rootstock more resistant than French.
Pear thrips.	Spray with distillate emulsion 5 gal., nicotine sulphate ½ pint, water to make 100 gal.; or dust repeatedly with 5% nicodust.	As soon as black thrips appear in blossom buds. Again if necessary.	Winter cover crop if not plowed under too early thought to keep thrips in ground until after blossoming season.
Red humped caterpillar.	See under prunes.		
San Jose scale.	See under apples.		Controlled by the spray for Italian pear scale.

WALNUTS

For Control of.	Treatment.	Time of Application.	Remarks.
Blight.	No specific remedy. Plant resistant varieties.		Control of aphids helps.
Codling moth.	(1) Basic arsenate of lead 3 lb., water 100 gal. (2) Dust with arsenate of lead 50%, hydrated lime 50%.	When first observed in May and June.	Time of spraying depends on climatic conditions.
Red humped caterpillar.	See under prunes.		
Walnut aphis.	Dust with 2% nicodust.	Last of May or first of June.	Second application often necessary in July or August.
Walnut blister mite	Lime-sulphur 10 gal., water to make 100 gal.	Spring.	Not serious as yet.

BRAMBLES (BLACKBERRIES, RASPBERRIES)

For Control of.	Treatment.	Time of Application.	Remarks.
Cane blight, leaf spot.	(1) 5-5-50 Bordeaux; or lime-sulphur 10 gal., water to make 100 gal.	During dormant season.	Cut out and burn infected parts, renew old plantings.
Anthracnose.			Control measures not yet worked out for California conditions.
Orange rust.	Cut off diseased parts and burn. Dormant spray with Bordeaux recommended for trial.		
Raspberry horntail.	Cut off young tips as soon as wilting is noticed. Remove dead canes in winter. Dig out borers.		
Rose scale.	Distillate oil emulsion or miscible oil.	Dormant season.	Lime-sulphur also gives some control.
Red berry mite.	(1) Lime-sulphur 10 gal., water to make 100 gal. (2) Wettable sulphur 5 lb. (see General Remarks), water 100 gal.	(1) When growth starts in spring. (2) Summer.	Only serious on Himalaya variety.

CURRANTS AND GOOSEBERRIES

For Control of.	Treatment.	Time of Application.	Remarks.
Mildew.	Lime-sulphur 3 gal., water to make 100 gal.	As buds begin to open and 2 or 3 times thereafter at 2-week intervals.	In California a dormant spray of lime-sulphur 10 gal., water to make 100 gal., followed by dusting with sulphur often effective.
Currant and gooseberry fruit fly.	Spraying ineffective. Cultivate thoroughly in winter and spring.		
Imported currant borer.	Spraying ineffective. Cut out and burn infested canes.		
Red spider.	Wettable sulphur 5 lb. (see General Remarks), water 100 gal.	When mites appear.	

STRAWBERRIES

For Control of.	Treatment.	Time of Application.	Remarks.
Leaf spot.	5-5-50 Bordeaux	Dormant season.	Clean up and burn leaves in fall.
Strawberry aphis.	5% nicodust.	When aphids appear.	Apply dust to underside of leaves.
Strawberry crown moth.	Spraying ineffective. Remove and burn infested plants. Plant only clean stock.		
Strawberry leaf beetle.	Spray with basic arsenate of lead 3 lbs., water 100 gal.; or dust with arsenate of lead 20%, hydrated lime 80%.	When pest is discovered.	Infested plants should be destroyed.
Red spider.	White lubricating oil emulsions.	When mites appear.	Avoid use of sulphur dusts or sprays.

GENERAL REMARKS.

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 33 to 34 degrees Baume.

Oil Emulsions—We have not been advocating the use of home-made oil sprays very strongly as there are not very many growers who seem to be able to make as good emulsions as can be purchased. Many brands of commercial oil emulsions are available. The directions given by the manufacturer for dilution should be followed in each case.

Wettable Sulphur—Wettable sulphur is made of hydrated lime, superfine sulphur and calcium caseinate. Use in the proportion of 8 lb. hydrated lime, 16 lb. superfine sulphur and 1 lb. calcium caseinate. The dry materials may be mixed in advance and stored for use. In preparing the dilute spray material, fill the tank about half full of water, then with agitator running, add the dry mixture slowly, directing the spray nozzle upon the material until it has disappeared in the water. In the above calendars, 5 lb. of this mixture are recommended for 100 gal. of water. Nicotine sulphate or arsenate of lead may be added if needed to combat soft-bodied or chewing insects.

Oil Emulsions for Scale on Peach Trees

By United States Bureaus of Entomology and Plant Industry

LUBRICATING oil emulsions, whether home-made or purchased from manufacturers, have proved effective for the control of the San Jose scale on dormant peach trees. The Bureau of Entomology has had four years' experience with the use of these emulsions on the same peach trees, with excellent scale control and no discernible injury to any part of the tree. Growers who purchase the emulsion ready for use from manufacturers should insist that it contain at least 65 per cent of oil by volume.

How to Prepare

Lubricating oil emulsion may be prepared from either of the following formulas:

1. The boiled formula:

	Small quantity.	Large quantity.
Red engine oil, or oil of similar grade	2 gal.	30 gal.
Potash fish-oil soap	2 lb.	30 lb.
Sufficient water added to make total volume.....	3 gal.	45 gal.

When a small quantity is to be prepared, the ingredients are placed in a kettle and boiled for a few minutes until the brown scum, which forms on the top, has disappeared. Then the kettle is removed from the fire and the contents are pumped twice under at least 60 pounds pressure while still hot. The emulsion prepared in this manner should be used shortly after it is made.

To make the boiled emulsion on a large scale, the following equipment is necessary: two 50-gallon barrels, one 300-gallon storage tank, one all metal triplex pump developing 250 pounds pressure, one four horsepower engine, one boiler, and necessary connections. Only growers with a large acreage or a group of growers with smaller acreages would find it practicable to employ this equipment. When made on a large scale and pumped four times under high pressure, the emulsion will hold up during the entire dormant spraying season or longer.

The oil may be either of paraffin or asphaltum base. Good results have been obtained with oils having a viscosity of from 150 to 250 seconds by the Saybolt method at 100 degrees Fahrenheit.

2. Cold-pumped formula:

The following equipment is necessary: two 50-gallon barrels, one duplex or triplex pump, and one three or four horsepower engine (the usual power sprayer with suction attachment).

Calcium caseinate ..... 4 lb.
Add this with thorough and rapid stirring to sufficient water to make ..... 2 gal.
Pour this mixture with constant stirring into .....13 gal.
additional water in a 50-gal. barrel.
Then add:
Red engine oil, or oil of similar grade .....30 gal.

The suction is then placed in the barrel and the motor is started. When the pressure registers 250 pounds, the ingredients are allowed to be sucked through the pumps and out through either one or both spray rods, either with disks removed or with disks having a three-sixteenths-inch aperture, into another 50-gallon barrel. This emulsion should be passed through the pumps under pressure three times and should be made daily as required. **(Caution: In using this formula do not begin by adding the oil to the water, as an emulsion useless for spraying will result.)**

How to Use

The stock emulsion, whether prepared from either of the formulas above or purchased from insecticide dealers, should contain approximately 66⅔ per cent of oil by volume. For the control of San Jose scale on peach trees in the South, use nine gallons of the stock emulsion to 191 gallons of water. One thorough application is usually sufficient for satisfactory scale control; however, if necessary, a second application may be used during one dormant season. It is very important to cover every part of the tree with the emulsion, as the spray kills only the scale that it hits; portions of a tree not covered may result in the whole tree, and possibly the whole orchard, being reinfested.

Lubricating oil emulsions can be used any time after the trees become dormant. They should not be used while the trees are in foliage, as the leaves interfere with spraying the twigs, and furthermore, partial defoliation will result. The soap emulsions are much more satisfactory when mixed with soft water, and this should be used if available. The casein emulsion can be used with either soft or hard water. If the soap emulsions break down in hard water, add ¼-¾-50 Bordeaux to the water before putting in the stock emulsion.

Tanks that have been used for lime-sulphur spraying must be thoroughly cleaned before being used for oil emulsions. Lime-sulphur residue may be removed by running a strong solution of caustic soda through the pumps, and also by scrubbing the inside of the tank with the material.

Examine the stock emulsion for free oil before and after adding water. Free oil renders the emulsion unfit for use and should be discarded or repumped. Never let the stock emulsion freeze, which occurs at about 15 degrees Fahrenheit.

Combined Control of San Jose Scale and Peach Leaf Curl

Peach leaf curl, a disease which occurs in the spring and is manifested by swollen and distorted leaves and twigs, with sometimes quite serious damage to the trees, can be controlled by adding Bordeaux mixture, 4-4-50 strength, to the oil emulsion spray. The main point to be remembered is that the spray *must* be applied before the buds begin to swell. Otherwise, no control will be obtained, irrespective of the materials used.

How to Prepare Bordeaux Mixture

Prepare a stock solution of copper sulphate (bluestone) by suspending 50 pounds of the crystals in a clean sack at the top of 50 gallons of water in a container (a clean wooden barrel with wooden hoops is preferable; if it is necessary to use a barrel that has contained lime-sulphur, it should be very carefully cleaned). This will dissolve in 24 hours, or within an hour if hot water is used. The stock solution of lime is prepared by slaking 50 pounds of high grade stone lime into a thick paste and then making it up to 50 gallons by adding water.

How to Use Bordeaux Mixture

Thoroughly stir both stock solutions, and then measure out 16 gallons of the stock solution of copper sulphate (carrying 16 pounds of copper sulphate) and pour it through the strainer into a 200-gallon spray tank that is about two-thirds full of water. With the *agitator running*, slowly pour 16 gallons of the stock solution of lime (carrying 16 pounds of lime) into the tank, mixing it with the diluted copper sulphate solution. Pour in the stock oil emulsion and add water to make 200 gallons.

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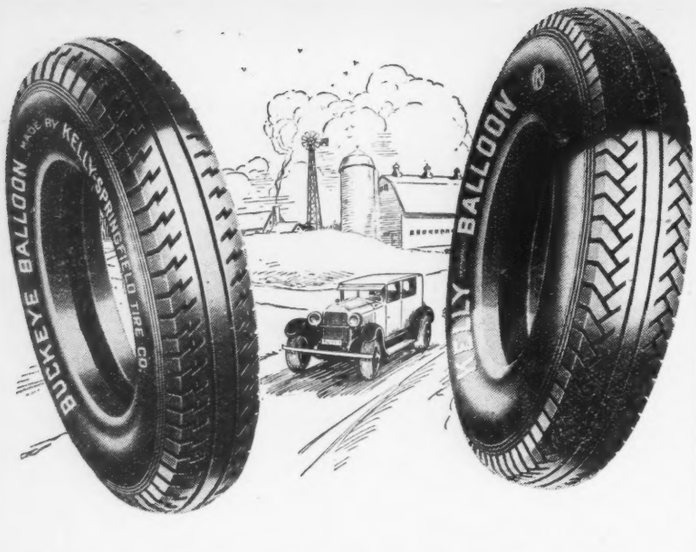

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KELLY SPRINGFIELD PNEUMATIC TIRES

The Strawberry Weevil Is Proving a Serious Pest

FROM different sections of Missouri complaints are being received by the College of Agriculture of the University of Missouri regarding a small snout beetle or weevil which is cutting the stems of the strawberry blossoms and newly set fruits. This is known as the strawberry weevil and is more or less abundant every year, says Leonard Haseman, entomologist at the college, though apparently it attracted more attention than usual this spring.

This little weevil lays its eggs in the opening blossoms and then cuts off the stem of the blossom so that its off-spring, on hatching, will have an opportunity to feed on the pollen of the injured blossom. The insect affects only staminate varieties of strawberries, which means those varieties which produce pollen. In some sections of the country growers overcome the injury by using non-staminate varieties as the valuable fruiting variety and alongside these a staminate variety which supplies the pollen and which becomes infested, but since it is not the one in which the grower is interested for fruiting, the weevil injury is of no consequence. In southwest Missouri, where the Aroma variety is the commercial berry, the weevil must be handled largely through good cultural management, including the elimination of the favorable winter harbors alongside strawberry fields. Where the pest proves particularly injurious, the use of arsenical sprays just before blooming time, is also helpful in checking the damage. Bordeaux mixture combined with the arsenical spray is usually recommended.

While it is impossible to recommend any treatment that will check the weevil so far as the present crop is concerned, since most of its damage has already been done, still growers should keep in mind the fact that this insect often does very serious damage to the Aroma variety and they must be prepared in the future to keep it under control. It is also worth mentioning in this connection that the Missouri State Plant Board, anticipating the greatly increasing acreage of strawberries which is likely to be planted in future years, began last fall with the program of rigid strawberry field inspection so that growers in the future will be able to purchase inspected and certified strawberry plants. This will help to prevent so far as possible any further distribution of the insects and diseases which affect strawberries, and in this way the plant board work will help immensely to protect the strawberry industry of the future.—*Missouri Farm News Service.*

Dilute Versus Standard Sprays for Apple Blotch

(*Continued from page* 4)

spraying (and for that matter up to the present day) these were the only spraying materials of recognized merit. But we were hopeful that something new and helpful might be learned from use of these well-known materials in various proportions and combinations.

Some New Bordeaux Formulas Planned

In this new series of spraying experiments, in the hope of lessening danger of injury to foliage and fruits by use of the so-called "standard" Bordeaux, containing at least three pounds of copper sulphate to 50 gallons of water, and to conveniently maintain the same proportions of copper and lime in the different modified or dilute Bordeaux sprays to be used in comparison with the standard or more concentrated strength, we adopted the rule of using three parts by weight of high grade hydrated lime to one part of copper sulphate. Thus compounded, our various Bordeaux mixtures contained *different quantities* but always the *same proportions* of copper and lime, as follows: 3-9-50, 2-6-50, 1-3-50 and ¾-2¼-50.

In addition to using these widely differing strengths of Bordeaux in competition each with each other, we planned to impartially subject them to comparison with lime-sulphur sprays in combating both apple blotch and apple scab. Both the commercial lime-sulphur solution and the commercial dry or powder form of the same compound were used in these tests.

Inclusion of lime-sulphur sprays for prevention of apple blotch, in these new experiments, we were fully aware, would be criticized and, very likely, even ridiculed by some of the recognized authorities on spraying, who firmly maintained (and continue to do so) that apple blotch could not be controlled successfully except by use of strong or "standard" Bordeaux mixtures. But we were seeking dependable information as to actual results from *thoroughly applied sprays* and were willing to expose ourselves to whatever criticism might develop.

Standard and Dilute Sprays in Blotch Prevention

For our apple blotch prevention tests, a 20-year-old orchard of Ben Davis trees, situated on thin, poor upland in Washington county, was selected. This orchard, due to extreme prevalence of blotch, had produced no salable and but very little usable fruit for several years. The trees were lacking in vigor from scarcity of plant food in the soil and were badly infested with San Jose scale. It was, indeed, as badly afflicted an orchard as could be found in all southern Ohio.

The orchard was divided into plots, each of which, so far as possible, was to be treated with the same spray formula throughout the five-year period. This was not found practicable in all cases, however, as there sprang up a demand each successive season for inclusion of additional sprays for testing, or for revised formulas of those with which we already were more or less familiar. These unforeseen requirements necessitated some changes in plot treatments during the period of the test, and they account for the fact that, as indicated in the tabular record which follows, some of the sprays were subjected to the full five-year trial, while others were used for lesser periods of time.

A basic or "all-over" spraying with either strong (1-8) commercial lime-sulphur solution or oil emulsion was given this orchard each spring just as the leaf buds were swelling for the control of San Jose scale.

In order to present in the least possible space the more important points of the great mass of data secured in the five-year period of these experiments for prevention of apple blotch, we are submitting herewith a much condensed tabular statement of results. In this table, the time schedule for the different spray applications and the many different formulas used, are so clearly indicated that additional explanation is unnecessary. The table is followed by comment on the more important and interesting features resulting from the five years of thorough and conscientious work.

RESULTS OF SPRAYING TO CONTROL APPLE BLOTCH, 1922-26.
CONDENSED SUMMARY.

	In the pink spray	Open calyx spray	*Two-weeks' spray	**Four-weeks' spray	***Six-weeks' spray	Ten-weeks' spray	Years each spray used	Average wholly free from blotch
								Per Cent
No. 1	Bordeaux 3-9-50	Lime-Sulphur 1-40	Bordeaux 3-9-50	Bordeaux 3-9-50	.....	Bordeaux 3-9-50	Five	99.5
	2-6-50	1-40	2-6-50	2-6-50	.....	2-6-50	Five	99.2
	2-6-50	1-40	2-6-50	2-6-50	2-6-50	2-6-50	Five	99.6
	1-3-50	1-40	1-3-50	1-3-50	.....	1-3-50	Four	99 2
	¾-2¼-50	1-40	¾-2¼-50	¾-2¼-50	.....	¾-2¼-50	Five	98.2
No. 2	Lime-Sulphur 1-40	Lime-Sulphur 1-40	Lime-Sulphur 1-40	Lime-Sulphur 1-40	Lime-Sulphur	Lime-Sulphur 1-40	Five	95.1
	1-40	**1-40**	1-40	**1-40**	**1-40**	1-40	Three	99.0
	¾-50	¾-50	¾-50	¾-50	.....	¾-50	One (1926)	95.9
No. 3..	Check—No spraying			.....	.....	.....	Five	12.6
No. 4..	Dry Lime-Sulphur 4-50	Dry Lime-Sulphur 4-50	Dry Lime-Sulphur 4-50	Dry Lime-Sulphur	Dry Lime-Sulphur	Dry Lime-Sulphur 4-50	Four	96.2
No. 5..	Colloidal Sulphur 5-50	Colloidal Sulphur 5-50	Colloidal Sulphur 5-50	Colloidal Sulphur 5-50	Colloidal Sulphur	Colloidal Sulphur 5-50	Three	86.6
No. 6	Sulpho-cide & Kayso 1 qt.-50 lb.-50	Sulpho-cide & Kayso 1 qt.-50 lb.-50	Sulpho-cide & Kayso 1 qt.-50 lb.-50	Sulpho-cide & Kayso 1 qt.-50 lb.-50	Sulpho-cide & Kayso	Sulpho-cide & Kayso 1 qt.-50 lb.-50	Two	96.8
No. 7..	Hydrated Lime 9-50	Hydrated Lime 9-50	Hydrated Lime 9-50	Hydrated Lime 9-50	Hydrated Lime	Hydrated Lime 9-50	Three	85.5
No. 8..	Hydrated Lime & Kayso 9-1-50	Hydrated Lime & Kayso 9-1-50	Hydrated Lime & Kayso 9-1-50	Hydrated Lime & Kayso 9-1-50	Hydrated Lime & Kayso	Hydrated Lime & Kayso 9-1-50	Two	87.-

*The application two weeks after petal-fall may be regarded as the first "blotch spray" of the season. Blotch spores have been known to issue from the disease-cankered twigs and shoots as early as two weeks after petal-fall. Usually, however, spore discharge begins about three weeks after petal-fall, and may continue for a considerable period of time.

**The spraying four weeks after petal-fall properly may be considered the "special blotch application," as it usually is the only *extra* spraying that is necessary to secure satisfactory control of blotch, as compared with the regular program followed for prevention of apple scab and other fungous diseases of the foliage and fruit of the apple.

***The spraying six weeks after petal-fall, while possibly of considerable benefit in seasons when the blotch spores are discharged over an unusually long period of time, did not, in the experiments here under discussion, pay for the extra time and material expended. As will be noted in the table, the two, four and 10-

(*Concluded on page* 43)

Directions for Poisoning Field Mice

MICE cause serious damage to orchard trees every winter. One of the most satisfactory methods of combating them consists in setting poisoned bait in poison stations, so that birds and useful animals will not be killed. The rolled oat formula has proved to be one of the best for the purpose. In using this formula, proceed as follows:

Preparation.—Mix together, dry, one-eighth ounce of powdered strychnine and one-eighth ounce of baking soda. Sift the strychnine-soda mixture over one quart of rolled oats, stirring constantly to insure an even distribution of the poison through the grain. Heat the poisoned rolled oats in an oven until thoroughly warm. Mix three parts of melted beef fat with one part of melted paraffin, and sprinkle six tablespoonfuls of this mixture over the warm, poisoned rolled oats, mixing until the oats are evenly coated. Allow the grain to cool, when it is ready for use. If large quantities of the bait are needed, use one ounce of strychnine, one ounce of soda, eight quarts of rolled oats, and one and one-fourth pints of beef-fat-paraffin mixture.

It is very important that in applying the coating, the beef-fat-paraffin mixture be hot and the poisoned rolled oats be thoroughly warm, otherwise it will not be possible to obtain an even coating.

Distribution.—Tablespoonful quantities of the poisoned rolled-oat baits should be placed in small containers or stations to protect them from the weather, and these should be distributed over the infested area. The poisoned baits may also be scattered along runways and into entrances of burrows, a teaspoonful at a place. In orchards where mice are abundant, it is advisable to place one poison container under each tree. These should be set close to the base of the tree to escape cultivating machinery and should be lightly covered with vegetation, prunings, or some other material that will afford harborage for the mice. Poison containers should also be placed on high ground to avoid standing water and where a good circulation of air will aid in keeping the baits in good condition for long periods. They should be examined and refilled at least once a year late in fall, and preferably also in spring. With poison stations properly placed, a maximum of protection is furnished at a minimum of labor and expense.

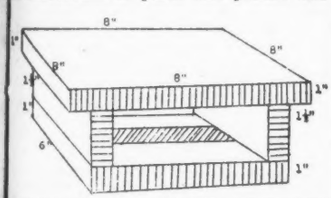

Diagram showing construction of a poison station as described

Poison Stations.—Poison stations may consist of any object which will protect the bait from the weather and from birds and larger animals. Wooden boxes, drain tiles of one and one-half-inch diameter, or larger, or wide mouthed jars or bottles serve the purpose fairly well. A home-made poison station consisting of two squares of lumber held apart by two short strips has proved most attractive to the mice. A convenient size is a six-inch square for the bottom and an eight-inch square for the top while the two side walls should be one and one-half inches high. A depression should be cut in the bottom board or floor to contain the poisoned bait. The whole may be fastened together with four nails.

Caution.—All poisoned baits and poison containers and utensils used in the preparation of poisoned baits should be kept *plainly labeled and out of reach of children, irresponsible persons, and live stock.*—*Ill. Agr. Exp. Sta., U. S. Bur. Biol. Survey, and Ill. Nat. Hist. Survey, Co-operating.*

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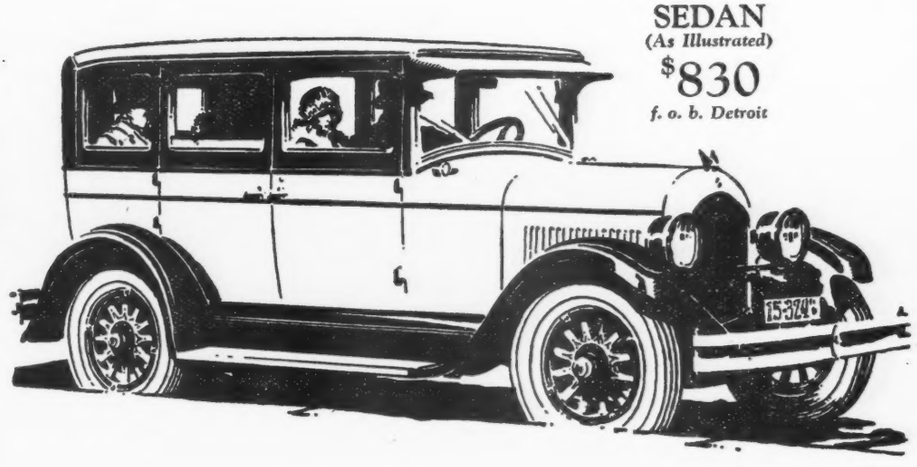

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Turned with nozzle pointed up, enables you to reach the under side of the tree, and its extra length makes it possible to use a fog spray where long-distance position would be necessary with the ordinary gun. Lighter and easier to handle than any other apparatus.

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5½ feet long with a 40° angle at the nozzle end. Made of 18-guage brass with all castings and parts of brass. Weighs only 3¾ pounds. Nozzle constructed to break up the spray at the long position when desired, and gives operator positive control of spray mist, enabling him to change the volume as he wishes. Has saved as much as 25% in spray material, decreased labor and increased speed.

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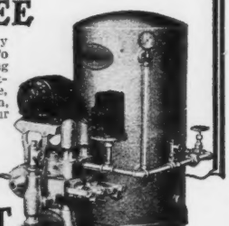

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The Editor's Mail Box

(Editor's Note: This department will include each month copies of letters received at the office and our answers to the same, if any. The department is intended for correspondence relating not alone to questions of production and marketing but for any matters relating to the fruit industry in which growers are interested. We cannot publish all letters received, but will select each month those which in our opinion will meet with the most general interest. Preference will be given to letters not over 150 words in length. Only letters that contain the full name and address of the writers will be printed. No attention will be paid to letters signed with the initials only.)

Mulch for Small Fruits to Replace Straw

Editor, AMERICAN FRUIT GROWER MAGAZINE: We operate the largest berry farm in Lafayette county, Missouri. For a number of years we have been experimenting in an effort to find a mulch that would replace straw, hay, etc., for strawberries and brambles. It occurred to us that our experience might be interesting to you and to the good readers of your wonderful magazine.

We have found oats sown about the middle of August or the first of September a solution of our problem. They will almost reach the heading stage when frost kills the plants. After being frozen, the oats will not mat down tightly over the plants but will provide a splendid winter cover. Strong winter winds have no effect on it.

This mulch keeps the berries clean in the spring. Furthermore, when incorporated into the soil this mulch will increase the content of organic matter and assist in holding moisture.

We have found the method very satisfactory with raspberries and blackberries, as well as strawberries. We find we can reduce the labor cost by sowing oats as described.

In conclusion, let me congratulate you on publishing one of the most educational horticultural magazines in America.—J. A. G. P., Missouri.

ANSWER: Your experience in using oats as a mulch for strawberries and brambles is most interesting indeed. No doubt other growers can profit from your experience. We are going to print your letter for their benefit.

I should like to raise one question in this connection. Recent investigations in strawberry culture have shown that bud formation takes place in the fall, beginning in September under normal conditions and continuing until late in the season. The early formed buds produce the best and largest fruit as a rule. It is advisable, therefore, to furnish the best conditions possible in the fall so that the largest and strongest fruit buds will develop. I wonder if the growth of the oats might not in some cases absorb moisture and fertility and shade the strawberry plants to such an extent that they will interfere with the best fruit bud formation. With varieties which form relatively few buds, it seems to me that there might be more effect of this kind than with more prolific varieties. Also, it seems to me that there might be more effect of this kind in dry than in moist falls.

Replanting an Old Orchard

Editor, AMERICAN FRUIT GROWER MAGAZINE: I have recently come into possession of an old orchard containing some very undesirable apple trees, which I have blasted out. This orchard is nicely covered with blue grass sod. The ground is literally full of apple roots and cannot be plowed. I want to replace the old orchard with young trees. Please tell me how I can handle and fertilize them successfully without destroying the blue grass sod.—W. J. D., Indiana.

ANSWER: I should not advise you to replant your old orchard to young trees at once. Apple trees remove large amounts of fertility, particularly nitrogen, from the soil. At any rate, it is a matter of common knowledge that young fruit trees grow poorly as a rule on land from which an old orchard has been removed. This may be due partly to disease and partly to the poor state of tilth which usually characterizes such land, but without doubt the fertility content of the soil is an important factor in this connection.

If you have other land available that is well adapted for an orchard, I would suggest that you plant your young orchard on it rather than on the old orchard site. However, if you should particularly desire to plant trees on the old site, I should advise that you plow the land as thoroughly as possible and grow cultivated crops on it for two or three years before setting the young trees. Such treatment would put the land in good friable condition and would destroy many insects and diseases. It would be well also to grow one or two crops of sweet clover or cowpeas on the land before planting the young trees.

Whole Root or Piece Root Trees

Editor, AMERICAN FRUIT GROWER MAGAZINE: Is a fruit tree propagated from a whole rootstock a better tree than one propagated from a piece rootstock, in regard to rapidity of growth and earliness of coming into bearing?

I am asking this question because I contemplate setting a commercial apple orchard and I wish to know if there is any material difference as to which class of trees I plant, so far as the whole or piece rootstock is concerned.—J. L., Indiana.

ANSWER: There is no such thing as a whole rootstock, for with the very best care a considerable portion of the root will be left in the ground and furthermore, that which is removed is more or less weakened.

I think that any piece of root which is large enough to give the scion a fair amount of nourishment will be as good as a larger root. Of course if the root should be cut into very small pieces, there would not be enough elaborated food in the root to supply the scion while the graft union was developing and the young tree was getting a start in life. In such cases, the tree would start slowly and the effect might be apparent for several years. However, such trees should become as good trees in time as other trees. I think that if the root piece is three or four inches long, this will be sufficient and that as good trees will result as from so-called whole roots.

Mowing a Cowpea Cover Crop for Hay

Editor, AMERICAN FRUIT GROWER MAGAZINE: Is it harmful to plant peas in a young peach orchard and mow for hay?—R. P. F., Arkansas.

ANSWER: In general I do not believe it is a good thing to plant cowpeas in an orchard and mow the same for hay. In the first place, the trees need all the fertility that they can get in order to mature their crop successfully. The pea plants contain considerable fertility and when you remove the growth, you take this fertility off the land. Of course, if you feed the peas and return the manure to the land, you will offset this disadvantage to a considerable extent.

You should also bear in mind that when you spray an orchard with arsenicals some of the poison gets on the peas. In some cases, damage has resulted to stock from hay taken from a sprayed orchard.

In general, I think it would be best to plant peas in an orchard and work the growth into the ground with disc or plow rather than to take the hay off the land.

Reshaping a Young Apple Tree

Editor, AMERICAN FRUIT GROWER MAGAZINE: Will you kindly give me your advice as to the treatment of my young apple trees. I planted two-year-old trees and the tops were formed rather high. Please tell me if possible what I can do to make the trees develop branches lower so that I can develop the framework lower down on the trees.—A. H., Illinois.

ANSWER: I do not believe it would be advisable to cut back the tops of your two-year-old apple trees in the hope that more branches will develop lower down on the trunks. Such treatment gives the trees a severe shock and they often do not recover from

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the same for a long time. Furthermore, branches do not usually come out where they are wanted, and in many cases trees of bad form develop.

It seems to me that your best procedure would be to give your trees the best shaping possible under the circumstances. Some of the trees will no doubt develop branches or suckers below the framework. Such branches and suckers can be used to develop a lower framework. Thinning out of the main branches and moderate heading back of the terminals will tend to encourage the development of suckers and branches on the lower part of the trunks.

Another method of procedure would be to take out the two-year-old trees and replace them with one-year-old trees. I have always preferred one-year-old trees myself for the reason that one can develop from them the type of framework he most prefers.

It seems to me there is a tendency now in some places to develop higher heads than formerly. Many trees with fairly high heads are giving excellent satisfaction. I would suggest that you read in this connection the article by Prof. F. C. Sears in the January issue on page 27.

Repeal Weight Per Bushel Laws

Editor, AMERICAN FRUIT GROWER MAGAZINE: I agree with Louis Erb, in your January, 1927, issue, that weight per bushel laws should be abolished. However, I see little use in making such laws uniform. They attempt the impossible in trying to make a certain volume of any loose material always equal the same weight.

A better way would be to sell each material by measure or by weight, and not by both methods at once; by quarts or cubic inches, by measures, or by pounds. Laws should merely prescribe which method to use and give desired specifications regarding containers.—F. M. J., Massachusetts.

ANSWER: I apparently did not make myself clear to you in what I said about weights and measures, for I take exactly the same viewpoint as you. It is impossible to make any certain volume of perishables always weigh the same, since the weight varies with the variety, the size of the specimens and the season.

As you suggest, it would be best to sell all perishables by weight or by measure, and not try to combine measure and weight, which is an impossible thing.

All state laws pertaining to weights and measures for perishables should be repealed. There should be a national law with reference to selling perishables by measure or by weight. Under this plan, a uniform system could be employed throughout the country to the advantage of all concerned. Such a system would eliminate many of the questions which confront growers and dealers as a result of our weight per bushel laws for perishables in different states.

Pears as Fillers Between Apples

Editor, AMERICAN FRUIT GROWER MAGAZINE: Please advise me if I can plant pear trees among apple trees. The writer has been told to always keep pear trees away from apple trees because the pear trees are attacked by a blight that will affect the apple trees. I have 75 acres of apples and do not want to spoil them by putting in some pears if they will do any damage.—W. J. K., Kentucky.

ANSWER: I would not advise you to plant pear trees between the apples. The pears are quite subject to pear blight, and the blight spreads to the apples. It is, of course, possible to keep blight within fairly good control by proper methods of pruning and spraying, but in your southern climate it is much worse than in northern sections and there is more difficulty in keeping it under control. If you want to grow pears, I would suggest that you plant them on a separate piece of ground. This is better practice even when the question of pear blight is not involved.

Rather than plant pear trees as fillers between apples, I would recommend that you use early bearing varieties of apples.

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Special Sedan $945—De Luxe Sedan $1075
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MOTOR CARS

Kill Citrus Aphids Now

CITRUS APHIS are more abundant in Florida citrus districts at this time than a year ago, according to J. R. Watson, entomologist of the Florida Experiment Station.

The amount of damage the aphids will do will depend largely on the spring weather and the control measures used by growers. In cool springs, the aphids are able to cover the new growth as rapidy as it is put out by the trees. When a cold winter is followed by an abrupt change to warm spring weather, the aphids do not have time to multiply to large numbers before the spring growth hardens up.

However, growers should not depend on nature to control the aphids. The groves should be cleaned up now. Destroy every aphid in the groves so that the trees will be clean when spring growth starts.

Growers need to look for aphids at present only on young growth. If this growth is at the end of the branches, as is usually the case, the best way to kill the aphids is to dip all the infested twigs in a bucket of water containing a tablespoonful of nicotine sulphate and two tablespoonfuls of soap or Derrisol.

When new growth exists in the interior of trees where dipping is not practical, dusting must be resorted to. A three per cent nicotine sulphate-lime dust, applied in still weather, will usually bring good results. The dust may also be applied under tents. Directions for making tents for trees will be supplied by the experiment station at Gainesville on request.

Poisoning Undesirable Trees

UNDESIRABLE trees in bottom lands are being killed in Texas by poison. The mixture being used consists of one and three-fourths pounds white arsenic and two and three-fourths pounds sal soda mixed with one gallon of water. This amount will kill about 40 trees. The trees are first girdled, and then the cut surfaces are saturated with the poison solution. It is said that the stumps do not sprout when this method is employed.

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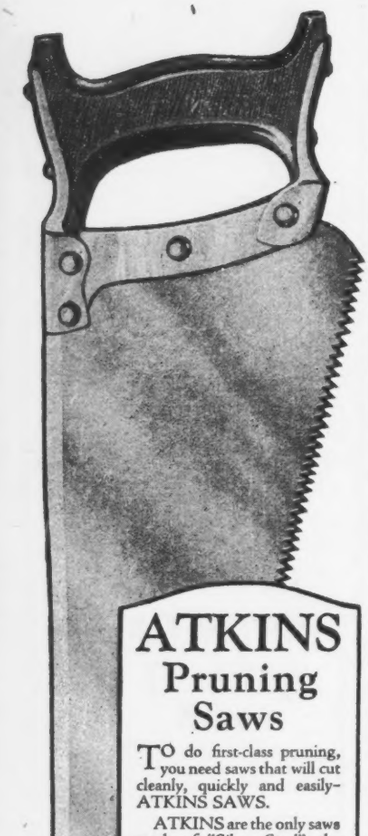
SILVER STEEL SAWS



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Saws

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ATKINS are the only saws made of "Silver Steel", the finest steel ever used in saws. It takes a remarkably keen edge and holds it a long time. It assures fast, easy cutting and less filing—a big saving of time, work and money.

Illustrated is ATKINS No. 44 Saw, a handy tool for cutting large or awkward limbs. Blade is special tempered steel, practically unbreakable. Handle is pressed steel with wood grip. Extra large—plenty of room for gloved hand.

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Some Don'ts for Fruit Growers

DON'T use Bordeaux in extremely cool weather.

Don't use lime-sulphur in extremely hot weather.

Don't apply any spray while a tree is wet after a rain or heavy dew.

Don't use high pressure and a gun to spray peaches.

Don't use *approximate* measures or weights.

Don't spray out the last portions of a tank by stopping at and drenching one tree.

Don't apply in a wholesale manner every new proprietary spray material that appears on the market.

Don't be afraid of a Baume tester. It won't hurt you, and it will do your fruit much good.

Don't pack forbidden fruit.

Don't permit the hired man to enlarge the hole in the spray disk just to spray faster. Regular spraying enlarges it too fast anyway.

Don't give an able-bodied hired man a gun—give him a rod.

Don't fail to apply a wound dressing after heavy pruning.

Don't use lime-sulphur during hot weather just because you have a few barrels left over.

Don't expect results from broken-down men, horses and spray machinery.

Don't add lead arsenate directly to lime-sulphur; first mix it with slaked lime at the rate of two pounds of lime for each pound of lead arsenate.

Don't forget to clean your spray outfit after each spray. It will prolong the life of the machine.—*Bulletin 94 of Virginia Agricultural and Mechanical College.*

Preparation of Dry-Mix

DRY-MIX, also called wettable sulphur by some authorities, was developed by the New Jersey Agricultural Experiment Station as the result of a desire to find a spray material better suited for summer spraying of stone fruits than existing fungicides.

At first, glue was used to bring the sulphur into suspension in the water, but in the spring of 1922 it was discovered that casein-lime could be substituted for the glue and thus produce a mixture of sulphur and lime that would mix readily with water.

The formula for making 100 gallons of finished spray mixture calls for superfine sulphur 16 pounds, hydrated lime eight pounds and casein-lime (calcium caseinate) 16 ounces. The sulphur should be sifted through a 12 to 14-mesh screen to remove lumps. The materials should then be mixed thoroughly in the dry condition. The mixture may be stored in this form.

One of the best ways to prepare the dilute mixture is to fill the spray tank about half full of water, add the dry mixture gradually, and, with agitator running, direct the spray nozzle or spray gun onto the material until it is thoroughly mixed with the water.

Dry-mix takes the place of self-boiled lime-sulphur for stone fruits, and it is easier to prepare.

Nicotine sulphate may be added to control sucking insects, and arsenate of lead may be added to combat chewing insects.

Black End Rot of Bartlett Pears

PROF. M. J. HEPPNER of the Division of Pomology located at Davis, Calif., advises us that there is a discrepancy in the statement in our January issue concerning black end rot of Bartlett pears. He states that Bartlett pears on French roots have shown in his experiments fewer affected pears than trees of the same variety growing on Jap roots. Some affected fruits were found on trees growing on French stocks, but in general it appeared that when this was the case, the trees were growing on soils which were wet in the winter and dry in the summer. Our readers should take note of this correction.

THE FINAL estimates for fruit production in 1926 for the United States as a whole, as compared with the production in 1924 and 1925, were issued by the United States Bureau of Agricultural Economics on December 20. The average farm prices prevailing on December 1 of each year were also given out. The figures for the important fruit crops are as follows:

PRODUCTION OF IMPORTANT FRUITS, 1924-26

	Estimates on Dec. 1.	Farm price per unit Dec. 1
Apples, total		Cents.
1926	246,460,000 bu.	72.7
1925	172,389,000 bu.	125.7
1924	171,725,000 bu.	118.1
Apples, commercial		
1926	39,095,000 bbls.	$ 2.19
1925	33,246,000 bbls.	3.67
1924	28,013,000 bbls.	3.66
Peaches, total		Cents.
1926	68,425,000 bu.	100.2
1925	46,562,000 bu.	137.8
1924	53,848,000 bu.	126.4
Pears, total		Cents.
1926	25,644,000 bu.	88.7
1925	20,720,000 bu.	140.3
1924	18,866,000 bu.	141.5
Grapes		
1926	2,349,117 tons	$ 27.58
1925	2,064,085 tons	32.03
1924	1,777,722 tons	41.79
Oranges (Calif. and Fla.)		
1926	33,900,000 boxes	$ 2.74
1925	33,300,000 boxes	2.82
Grapefruit (Fla.)		
1926	6,900,000 boxes	$ 2.00
1925	7,300,000 boxes	2.00
Lemons (Calif.)		
1926	7,200,000 boxes	$ 2.00
1925	7,136,000 boxes	2.11
1924	5,125,000 boxes	2.40
Cranberries		
1926	720,000 bbls.	$ 6.75
1925	569,000 bbls.	11.20
1924	582,000 bbls.	9.42

THE CO-OPERATIVE luncheon of the American Farm Bureau Federation in Chicago early in December was attended by 750 delegates and guests. All the food was secured from co-operative marketing associations, including the Florida Citrus Exchange; Lindsay Ripe Olive Company; Michigan Potato Growers' Exchange; Vermont Maple Products Co-operative Exchange; California Fruit Growers' Exchange; Utah Poultry Producers' Co-operative Association, Inc.; Sun-Maid Raisin Growers of California; Land O'Lakes Creameries, Inc.; California Walnut Growers' Association; Illinois Fruit Growers' Exchange; Quincy Co-operative Milk Producers' Association, Illinois; Simpson Orchard Company, Indiana; Mesa Lettuce Growers' Association, Arizona; Central States Soft Wheat Growers' Association; and National Pecan Growers' Association.

Another feature of importance was the presence of 60 outstanding leaders in co-operative marketing, each of whom contributed a brief statement on the fundamental principles of the movement. The reading of these statements formed the speaking program of the luncheon.

ARTHUR KARR of Yakima, Wash., has recently sent us a copy of the *Yakima Sunday Herald* for January 2, which gives the agricultural production of Yakima county for 1926.

The county produced fruits and farm products valued at $40,650,170. A very wide assortment of farm products is grown in the Yakima district. The fruit production consisted of approximately 14,000 cars apples, 4000 cars pears, 1250 cars peaches, 1975 cars mixed fruit, 250 cars cherries, 220 cars plums and prunes, 80 cars apricots, 30 cars strawberries, 118 cars grapes and 830 cars cull apples shipped to outside points. The value of the fruits grown in Yakima county in 1926 is conservatively estimated at $16,386,390. The value and the shipments of fruit would have been still greater had it not been for the unfavorable harvesting conditions existing during the fall, and for the large crop of fruits of all kinds produced elsewhere during the past year.

EFFORTS are being made to develop a uniform apple grading law for the New England states. Representatives of the state horticultural societies met at Boston a year ago. A final draft of the proposed law was submitted to the New Hampshire Horticultural Society last November. Certain changes were deemed necessary, and a special committee was appointed to redraft the recommendations. The committee has completed its work and offered its draft to fruit growers of New Hampshire. It is suggested that all growers who have fruit in storage grade a few barrels in conformity with the suggested grades in order to discover defects, if any, in the grading regulations.

The packing and grading law was discussed at the winter meeting of the horticultural society at Concord on January 13. It was planned to outline a final draft which would be submitted for legislative approval.

REORGANIZATION of the fruit interests of South Africa was effected recently under the name Fruit Exchange, Ltd. The organization is to be divided into two branches, known as the South African Co-operative Citrus Exchange and the South African Co-operative Deciduous Exchange. Each organization will handle the marketing work of its respective groups and also purchase fertilizers, machinery and other supplies. The headquarters of the fruit exchange and of the deciduous exchange branch will be at Cape Town and the citrus branch will have its headquarters at Pretoria.

The reorganization plan provides for the setting up of a federal board which will take charge of all overseas work, including market representation, propaganda, advertising, standardizing, arrangements with shipping agencies, and other functions. The federal board will also co-operate with the two group organizations in local propaganda work. It is expected that under this plan shipments can be handled to better advantage, that lower rates can be secured, and that shipments can be co-ordinated with the demand in England and on the continent.

SEALD-SWEET juice extractors of the Florida Citrus Exchange have been installed as regular equipment in the dining cars of the Chicago, Milwaukee and St. Paul Railroad. Recently this railroad put in an order for 50 more of these extractors. This development is due to the work of F. M. Reuther, Chicago representative.

The extractors are also in use on the Dixie Flyer and the Dixie Limited of the Chicago and Eastern Illinois Railroad. Probably they will become regular equipment on this railroad also.

It should be noted that the increased consumption being brought about by these extractors is the result of a complete and well-balanced program of merchandising in which all of the important factors are properly co-ordinated. Such activities as these would be impossible if the Flor-

ida growers were not organized from a merchandising standpoint.

THE MONTHLY report of the Bureau of Agricultural Economics, United States Department of Agriculture, shows the following cold storage holdings of apples January 1, 1927:

4,067,000 barrels compared with 3,855,000 barrels January 1, 1926, and a five-year average of 3,722,000 barrels.

13,150,000 boxes compared with 11,868,000 boxes January 1, 1926 and a five-year average of 10,908,000 boxes.

2,496,000 bushel baskets compared with 2,103,000 bushel baskets January 1, 1926.

IN CAMERON COUNTY, Texas, according to the *Extension Service Farm News* of that state, two citrus growers brought their fruit to the co-operative packing plant. The first man had not dusted or sprayed for scale or rust mite, and over one-third of his delivered boxes were sent back as culls. The second man delivered 280 boxes, of which only four were turned down. This result is certainly a strong argument for the use of efficient production methods.

THE CALIFORNIA Fruit Exchange of Sacramento distributed refunds amounting to $420,000 to its member associations during November and December, 1926. This sum included the second refund on the 1925 crop and the third and final refund on the 1921 crop.

The exchange deducts seven per cent of the gross delivered sales to meet expenses, and these constitute a withholding account which is later to be refunded. The operating expenses have not in any of the last nine years exceeded three per cent, and there has therefore been about four per cent available each year for refunding. It is the policy to distribute the refunds in three payments. The first consists of one per cent of the gross delivered sales and is made shortly after the close of the shipping season. The second, consisting also of one per cent, is made about a year after the close of the season. The third and final refund of about two per cent is made at the end of the fifth season.

The exchange is a federation of more than 100 local associations handling grapes, peaches, pears, plums, etc. It was formed in 1901 and is now marketing about 10,000 cars of fruit a year. Its operations extend into practically every important fruit section of California.

Credit Wrongly Given

THE BOYCE-THOMPSON Institute for Plant Research advises us that we wrongly gave credit to their institution, in the January issue, for establishing the Japanese Beetle Laboratory at Riverton, N. J. This laboratory was established in 1916 by the United States Bureau of Entomology and the New Jersey Department of Agriculture. It is being maintained at present by the Bureau of Entomology acting in co-operation with the departments of agriculture of Pennsylvania, Delaware, New York, New Jersey and Connecticut.

Through this laboratory, it has been found that a chemical called geraniol has pronounced attractive powers for the beetles. It was found that by spraying this material on less than an acre of trees, the beetles could be drawn to the leeward side of an orchard for almost half a mile within 15 minutes after the spray was applied. This makes it possible to destroy large numbers of the beetles with a small quantity of a contact spray.

In the experiments, traps baited with geraniol have been developed which give much promise. However, they are not recommended for general use as yet. Patents on these traps have been taken out by employees of the United States Bureau of Entomology in order to protect the interest of persons who may wish to use them.

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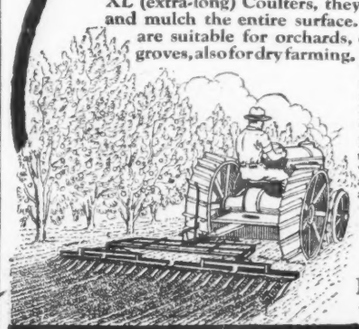

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Leaf Roller Control in Pacific Northwest

(Continued from page 5)

in water by placing in a large can and shaking vigorously. The oil is then added and the mixture is pumped under pressure for three or four times. Some growers prepare their cold-mixed emulsions in the spray tank for immediate use. The calcium caseinate and water are placed in the tank and dissolved, after which the oil is added. The pump is started and the material is pumped through the gun back into the tank until it is thoroughly emulsified; then the remainder of the tank is filled with water. Twenty-eight ounces of calcium caseinate, seven gallons of water, and 14 gallons of oil are needed to prepare a seven per cent dilution in a 200-gallon tank.

An eight per cent emulsion requires 12 gallons of the stock solution in 88 gallons of water, while for a six per cent emulsion nine gallons of the stock emulsion and 91 gallons of water are necessary.

TABLE I.—RESULTS FROM COMMERCIAL OILS IN LEAF ROLLER CONTROL

Spray used.	No. of eggs unhatched.	No. of eggs hatched.	Per cent unhatched.
Sherwin & Williams Spra-Mulsion at rate of seven gallons to 100 gallons	2071	173	92.2
Dormoil at rate of seven gallons to 100 gallons	4283	196	95.4
Ortho heavy neutral oil at rate of nine gallons to 100 gallons	2186	112	93.7
Ortho crude oil emulsion at rate of 20 gallons to 100 gallons	2660	89	96.6
Dormoil at rate of eight gallons to 100 gallons	1462	8	99.3
Checks	476	1996	19.3

TABLE II.—RESULTS FROM HOME-MIXED OILS IN LEAF ROLLER CONTROL

Treatment.	No. of eggs unhatched.	No. of eggs hatched.	Per cent unhatched.
Conoco E pale paraffin 8-100, spreader emulsion	3363	101	97.1
Shell brown neutral 8-100, cresoap emulsion	3300	25	99.25
Shell brown neutral 8-100, spreader emulsion	3459	99	97.5
Shell brown neutral 6½-100, spreader emulsion	2702	0	100.
Shell brown neutral 9-100, spreader emulsion	3076	14	99.55
Shell brown neutral 8-100, spreader emulsion	3291	25	99.25
Shell brown neutral 8-100, Littooy's formula	1535	82	95.0
Calol red engine oil 8-100, soap emulsion, government formula	3784	70	98.2
Calol red engine oil 8-100, spreader emulsion	3061	7	99.78
Shell brown neutral 4-100, spreader emulsion	3966	119	97.4
Shell brown neutral 4-100, spreader emulsion	2501	0	100.
Check	719	1123	39.

Experiments with Oil in North Idaho

Experiments for the control of the leaf roller were started in north Idaho at Lewiston and Post Falls in the spring of 1922. These experiments have been continued over several years. Various proprietary oils as well as home-mixed emulsions have been tested, the strengths of the materials being varied according to their efficiency as ovicides. The results of our experiments, however, check very closely with those obtained by other experiment stations. In Table I results are presented from tests in which a number of commercial preparations were used. The results obtained were entirely satisfactory. Table II gives the results obtained from various home-mixed preparations. The oils used were lubricating oils, known on the markets as "brown neutral" and "red engine," to which calcium caseinate or soap had been added as an emulsifier. These home-mixed emulsions containing varying percentages of oil were used in the experiments. The various strengths gave good results, although some of the investigators in the Northwest are under the impression that a four per cent oil is too weak, and that the strength should be increased to six or eight per cent.

When to Spray

The results of our experiments, covering a period of several years, as well as experiments conducted in Utah, Washington and elsewhere, seem to indicate that the best time to apply the oil spray is in the spring as near the hatching date as possible. Ordinarily, this is just before the buds begin to open.

Recommendations

Summarizing the data obtained by the various experiment stations, we find that:

1. Control in cases of severe infestation can be accomplished only by the use of oil sprays.
2. Application should be made in the spring before the buds open.
3. Commercial oils should be used at the rate of eight gallons in 100 gallons of water.
4. A six to eight per cent home-made emulsion should be used.
5. Thorough spraying is necessary if satisfactory results are to be obtained.
6. Where there is a severe outbreak of leaf roller, the oil spray should be supplemented by an arsenical spray, applied at double strength as soon as the eggs hatch.

(The Illinois Natural History Survey kindly furnished the pictures used to illustrate this article.)

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Selection and Use of Portable Spray Outfit

(Continued from page 4)

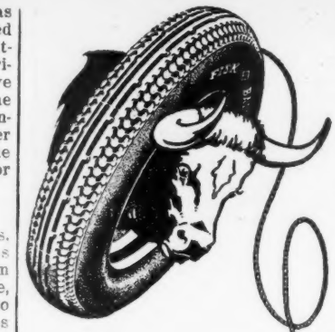
and gardens, where a systematic spray campaign is to be consistently carried out. These are readily portable, and are made of such a size that one person can easily transport them. The bucket pumps are made to be set into a bucket or small tub, and are provided with a foot support by which the device is held steady while being operated. Knapsack pumps, as their name indicates, are carried on the back of the operator, who operates the pumping mechanism with one hand while he directs the spray nozzle with the other.

3. *Barrel and Tank Outfits*, designed for general use in large gardens and in orchards of moderate size. Various types of this class are available, and thousands of them are in general use because of their convenience, comparatively low cost, and real economy. While too large to be considered portable for one man, they can readily be transported on a sled or small truck with great facility. They are large enough to provide pressure for one lead of hose.

4. *Power Spray Equipment*, in which pressure is developed by some kind of mechanical power, usually a gasoline engine. It is in outfits of this kind that the need for a real engineering knowledge becomes decidedly evident. Equipment of this kind is used by commercial orchardists who must cover large acreages expeditiously and economically. Indeed, without equipment of this kind, the large scale fruit grower would be lost, for the need for frequent sprays is so great that with the smaller outfits, his crops would be destroyed before he had anywhere near reached all his trees.

Mechanism in Small Outfits

In the smaller spray outfits, which come under the second and third classifications noted above, there is considerable mechanism of importance. The pump itself must be constructed properly and substantially if it is to give good service. The pump cylinders should be of materials that will stand wear, and not be subject to corrosion, either from moisture or the chemicals



What Is Back Of The Claim?

Any one can make a claim. But a claim is meaningless unless it is backed up by performance. Results are achieved only after definite planning. Fisk tires have proved their worth, their value. Today Fisks are original equipment on a large proportion of the country's new automobiles. These owners of Fisk equipped cars naturally continue to buy Fisks because Fisks have proved themselves worthy.

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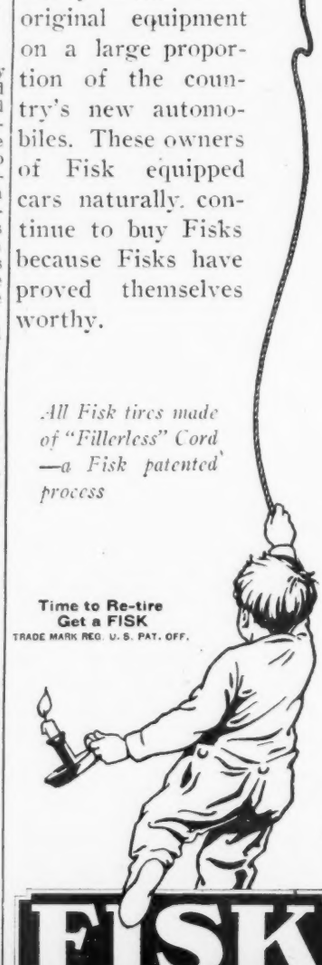


FISK BALLOON TIRES

of the spray mix. Of course, the manufacturer should understand this requirement, but he doesn't always seem to show it, if he does. There can also be a great difference in the convenience and effectiveness of the pumping mechanism; and in a good outfit the maximum pressure is attained and maintained with a minimum of effort. Levers, quadrants racks, and gears must be properly used if the best results are to be obtained, and indeed, there seems to be quite a difference in different sprayers in just these points.

Simplicity Is Important Factor

Simplicity in design and mechanical construction is also much to be desired in spray equipment of all kinds. The fewer parts there are, the fewer there are to wear out, as a general rule. Complexity is sure to lead to trouble and annoyance. What the operator wants is a pump that will operate easily and produce results at the lower cost consistent with good performance.

There should be many, many more of the smaller spray outfits in use. They are not expensive, and their operation can be readily understood. They are so efficient that even those who grow fruit on only a small scale can use them advantageously. I have known of instances where the improvement in the quality of the fruit on only a dozen trees has more than paid for the cost of the outfit and the labor of using it.

The barrel and tank outfits mentioned above can very handily be mounted on sleds or trucks, preferably the latter, for easy transport by a horse or two. Such trucks should provide low mounting, so that the outfit can be hauled around underneath the trees without difficulty. Drop rear axles, low front wheels, and convenient platforms for a man to stand upon, are common features of such trucks. Agitators for keeping the spray mixture stirred up are, of course, essential, and these vary according to the manufacturers' ideas of what is efficient. The pumps are either single or double acting, the latter, of course, giving more uniform pressures, since compression results from both forward and reverse motion of the pump lever.

Power Outfits for Large Orchards

The power operated spray pumps of modern days are a wonderful help to the large fruit grower. He usually has the power unit available, either in the gas engine he uses for other power purposes about his place, or in the small tractor which he uses for soil tillage, etc. Should he not possess one of these, he can purchase a power outfit, complete in every detail, including the transport truck, the tank, the pump, and the engine, all in one self-contained, convenient unit.

The essentials of such an outfit are fairly well satisfied by the equipment put out by our reliable manufacturers. The pumps are designed to operate with minimum attention, yet will give thoroughly dependable service. The engines are practically standardized—no longer is the gasoline engine a mystery. If an engine doesn't "shoot" after a turn or two of the crank, everyone knows that either there's no fuel, or no spark, or no compression, or the engine is too cold; and everyone knows the remedy off hand. The pumps are as reliable as the engine; the duplex, triplex, even quadruplex pumps give a steady strong pressure that shoots the spray from several nozzles into the tallest trees. The pressure control valves are marvels of ingenious design and readily maintain the 250 to 500-pound pressures that the modern spray operator desires when he wants to do first class work.

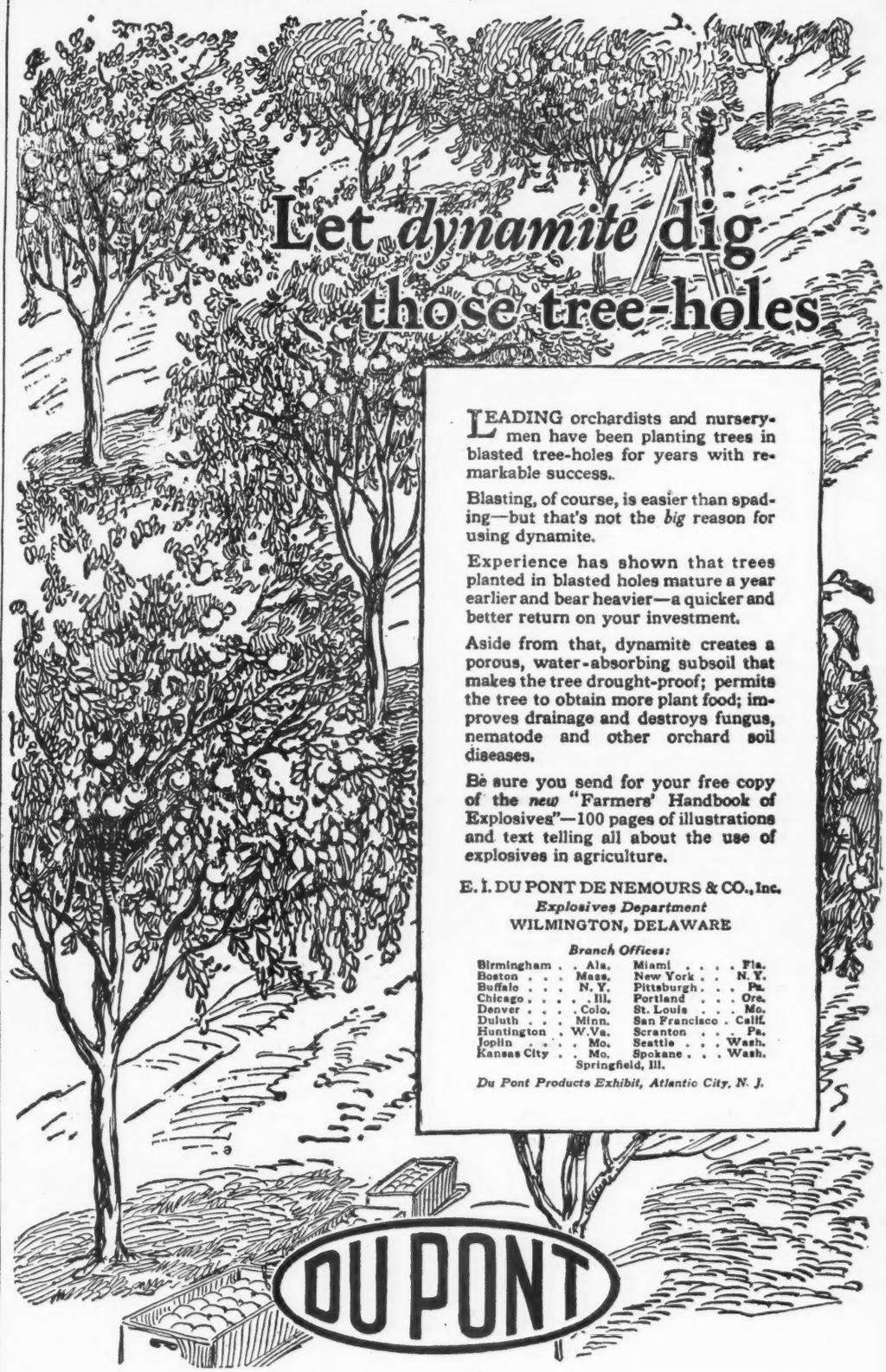
If the orchard acreage amounts to five acres or more, it is generally conceded that the power sprayer is the thing to use. It does the work so much faster and so much more economically that there is real economy in its use. It cuts down labor, and when sprays come thick and fast, it is the best insurance that the work will be done when it should be done, and done right.

Can be Used for Many Purposes

Many owners of spray outfits do not seem to appreciate the full utility of the outfits which they possess. When not used in spraying trees, why not use the spray outfit for spraying disinfectants around buildings that need them? And as a means of applying whitewash to cellars, fences, poultry houses, etc., a spray outfit is unexcelled. A spray outfit can be used for sprinkling, and for coating glass in greenhouses. Cattle can be sprayed to prevent annoyance from insects. Vehicles, automobiles, etc., can be readily washed down with a good pressure spray.

Of course, every spray owner should be interested in keeping his spray equipment in the very best of operating condition, so it will always be ready for use when needed. A spray pump should never be put away, not even over night, without giving it a thorough flushing with water to remove completely all spray materials. Following this, run through it a few gallons of water to which a pint or so of machine oil has been added. Clean all hose and nozzles thoroughly after every time the outfit is used. Keep the outfit under shelter, give it good care at the proper time, use it intelligently, and you will derive from it that measure of service and satisfaction which every reputable manufacturer sincerely desires to put into it.

Bordeaux mixture was discovered in France by accident as a result of lime and copper dust blowing across vineyards from manufacturing plants.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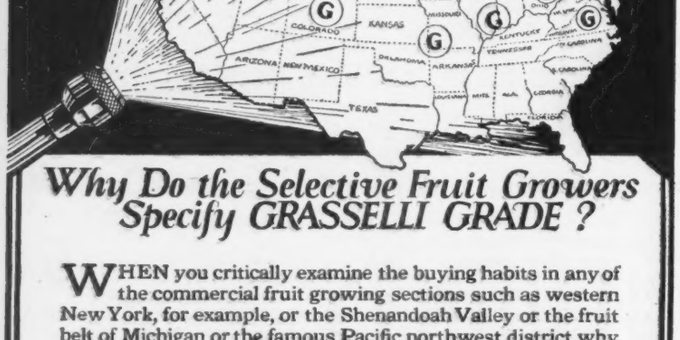
GRASSELLI
the National Insecticides



Why Do the Selective Fruit Growers Specify GRASSELLI GRADE ?

WHEN you critically examine the buying habits in any of the commercial fruit growing sections such as western New York, for example, or the Shenandoah Valley or the fruit belt of Michigan or the famous Pacific northwest district, why do you find the *careful* growers spraying with GRASSELLI?

And more significant still, why do they select it continually year after year?

Think it over.

There's a Grasselli dealer near you. If you don't know his location, write us. Grasselli Lime Sulphur Solution for your dormant spray should have early consideration.

THE GRASSELLI CHEMICAL COMPANY, CLEVELAND
Founded in 1839

GRASSELLI GRADE
Arsenate of Lead *Calcium Arsenate* *Lime Sulphur*
Bordeaux Mixture *Casein Spreader*

GRASSELLI GRADE
A Standard Held High for 88 Years

Spraying and Dusting Calendar for Florida

By W. L. Floyd, University of Florida

ALL SPECIES OF CITRUS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) When first spring growth appears.	Nicotine sulphate 1 pint, soap 5 lb., water to make 100 gal.	Aphids.	Bend over and dip ends of branches in a bucket containing the solution.
(2) Ten to 15 days after (1).	Dust with lime 97%, nicotine sulphate 3%.	Aphids.	Apply in calm weather to infested new growth.
(3) When fruit is 1 in. in diameter.	2½ lb. dry soda sulphur in 100 gal. oil emulsion containing 1% oil (see General Remarks).	White fly, scale insects, rust mites.	Oil emulsion sometimes injures small fruit.
(4) About June, during dry weather.	Dust with flowers of sulphur; or spray with lime-sulphur 2 gal., water to make 100 gal.	Rust mites, red spider.	Watch for mites; apply before they become numerous.
(5) Early in June after rainy season begins.	Parasitic fungi, such as Red Aschersonia and red-headed fungus.	White fly, scale insects.	Dissolve spores off in water, strain and apply with a clean hand sprayer.
(6) October or November.	2½ lb. dry soda sulphur in 100 gal. oil emulsion containing 1% oil (see General Remarks).	White fly, scale insects, rust mites.	The clean-up spray for the year.

GRAPEFRUIT AND SATSUMAS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Soon after petals have fallen.	3-3-50 Bordeaux plus oil emulsion to give 1% oil to mixture (see General Remarks).	Scab, melanose.	To prevent or check these diseases on tender growth. If only melanose is present, spray about 1 month later.

SPECIAL TREATMENTS

The following special treatments for citrus fruits are usually unnecessary under normal conditions; they are recommended for use under certain special conditions described in the column headed "Remarks."

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Before new growth unfolds.	3-3-50 Bordeaux plus oil emulsion to give 1% oil to mixture (see General Remarks).	Scab.	On young grapefruit and Satsuma trees when much scab is present. Prune out diseased parts as much as possible before spraying.
(2) February and March.	Dust with lime 97%, nicotine sulphate 3%.	Aphids.	Repeat every 4 or 5 days as long as aphids are found.
(3) When about one-half the petals have fallen.	Lime-sulphur 2½ gal., nicotine sulphate 1 pint, water to make 100 gal.	Thrips.	Apply when 25 or more thrips to the blossom are found.
(4) August or September.	Dust with sulphur; or spray with lime-sulphur 2½ gal., water to make 100 gal.	Rust mites, red spider.	May be necessary if weather is dry.
(5) October or November.	Copper sulphate spread like fertilizer about tree; use 2 to 6 lb. per tree, depending on size.	Ammoniation of fruit.	This prevents ammoniation on next crop.

AVOCADOS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) March, latter part of blooming period.	3-3-50 Bordeaux.	Scab.	
(2) About three weeks later.	3-3-50 Bordeaux.	Black spot.	
(3) About three weeks later.	3-3-50 Bordeaux.	Blotch.	
(4) October. As foliage begins to harden.	Oil emulsion containing 1% oil (see General Remarks).	Scale insects, white fly.	Alternate with (5).
(5) November to March, when pests are present.	Lime-sulphur 1½ gal., nicotine sulphate 1 pint, water to make 100 gal.	Leaf thrips, lace bugs, red spider.	
(6) When trees are in bloom.	Nicotine sulphate 1 pint, soap 5 lb., arsenate of lead 3 lb., water to make 100 gal.	Flower thrips, blossom anomala, leaf roller.	Unless thrips are numerous, omit nicotine sulphate and soap.

MANGOES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) When in bloom.	Arsenate of lead 3 lb., 3-3-50 Bordeaux 100 gal.	Anthracnose, blossom anomala.	
(2) November to March, when pests are present.	Lime-sulphur 1½ gal., nicotine sulphate 1 pint, water to make 100 gal.	Red spider, leaf thrips.	Repeat as often as necessary.
(3) December to February where trees are dormant.	Oil emulsion 1½ gal., water to make 100 gal. (see General Remarks).	Scale insects.	Alternate with (2)

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 32 to 33 degrees Baume.

Oil Emulsion—The directions in these schedules for oil emulsions are based upon the use of the government formulas. Directions for preparing oil emulsions according to these formulas are presented elsewhere in this issue.

Shall We Spray With Oil?

(*Continued from page 9*)

insects; it is quite effective in killing the winter eggs of red spiders or mites; and it controls apple and peach aphids if applied after the winter eggs have hatched. This can be done in many places, as the eggs hatch some time before the buds burst. The dormant oil should not be used after the leaves have started to come out.

Summer Oil Sprays

The successful use of oil for dormant spraying has led to many experiments with it for summer use, and we have on the market the so-called "summer oils." The chief value of a summer oil lies in its ability to control red spiders more thoroughly than any other material. It not only kills the spiders, but kills the eggs as well. With care, a summer oil may be used to control both the citrus and the deciduous mites.

We have three kinds of red spiders or mites on deciduous trees. One of these is the common or web-spinning red spider, which hibernates as a spider in trash or in the soil, and migrates to the trees in the spring. The other two kinds winter in the egg stage on the trees. These are the brown mite or bryobia, and the European red mite, which has recently become an important pest along the Atlantic and in the Pacific Northwest. A thorough application of dormant oil will often control these two kinds by killing the winter eggs. If a thorough application is not made, or if the spider to be fought is the common red spider, summer sprays must be resorted to. Sulphur in various forms, such as sulphur dust or weak lime-sulphur, may be used against the common red spider. The other two kinds are not as readily killed by sulphur, and oil has been used against them to a considerable extent.

Experiments are still being conducted to determine the best kind of oil for summer use. A surprisingly small quantity of almost any lubricating oil will control the spiders. It is unnecessary to use more than one-half to three-fourths of one per cent of oil in the dilute spray. But no oil has been found that is absolutely safe to use on the trees. At present, it is a question of choosing between two evils, the injury the spiders may cause to the fruit and the tree, if not controlled, and the possible damage from using oil. For this reason it is obviously preferable to control the spiders with dormant sprays when this is possible. If summer spraying must be employed, it should be done early, that is, before July 1. It should be done in cool weather, and a single thorough application of weak oil is preferable to several less thorough applications. Oils of the brown neutral type have been used without serious injury on apples and pears. The recently developed sprays containing highly refined "white" or crystal oils can be used with less danger of immediate burning. The relatively low volatility of these oils, however, causes them to remain on the trees for some time, and their repeated use has frequently resulted in dwarfing, scalding or spotting of the fruit. It is thought that a single application of this type of oil, at a dilution not exceeding one per cent, made as soon as the fruit is well set, will not have any deleterious effect on apples or pears. This may also be true of other fruits, although cases have occurred in California where such an application has affected the drying qualities of prunes.

Summer applications of oil for the San Jose scale must be considered a makeshift. It isn't logical to try to control scale when the leaves are on the trees to interfere with hitting it. It can be done more easily and more cheaply when the trees are dormant.

The addition of a small amount of oil emulsion to a nicotine spray will aid in controlling aphids, but this addition had perhaps best not be made until a safer summer oil is developed.

The use of oil for codling moth control has been and still is a very interesting possibility. The oil kills the eggs quite effectively, and practical tests have shown that it results in very good control when used in combination with lead arsenate. Used alone, the control is not as good. But whether used alone or with lead arsenate, repeated applications are necessary in order to kill the eggs which are being laid at intervals during the season. This has resulted in so much injury to the fruit with the oils now available, that at present oil cannot be recommended for codling moth control.

Summary

Summing up the oil spray situation, we may say that oil has proved satisfactory for dormant use. Good oil emulsions or miscible oils may be obtained on the market for this purpose, making it unnecessary to use the home-made materials. With care and an ordinary degree of intelligence, no grower should have difficulty in using the dormant oils.

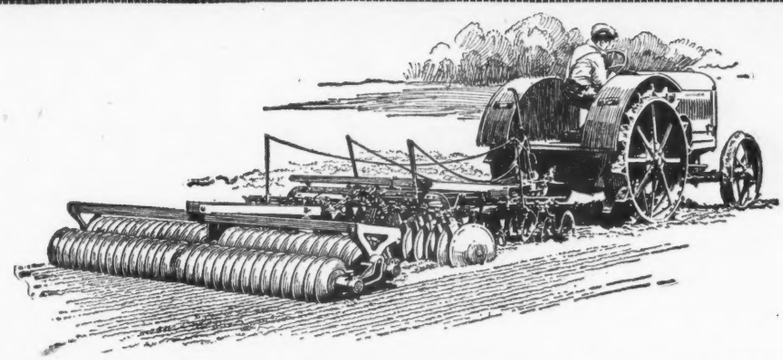
The use of oil for summer spraying has not been very thoroughly worked out. For the present, the grower should use it for this purpose with the understanding that it may not be absolutely harmless to the crop. As a matter of fact, lime-sulphur, Bordeaux mixture and lead arsenate, three of our commonest sprays, are not under all conditions absolutely harmless to the crop. There is reason to believe that the use of oil during the growing season will be greatly extended as further research is made and as the grower becomes more familiar with its limitations and possibilities. Growers who use oils for summer spraying should do so with these facts in mind.

Soften Hard Water Before Use for Spraying

HARD WATER should be softened before being used in the preparation of spray material, according to Prof. R. H. Robinson of the Oregon Agricultural Experiment Station. Chemical changes take place in hard water which cause certain substances to change to an inert form. Some of these inert forms cause severe damage to foliage.

Soap reacts with arsenate of lead and forms a soluble compound which may prove dangerous. When such waters must be used, about two pounds of quick lime or hydrated lime should be used to each 100 gallons of spray solution. The lime should be added to the water first, followed by the addition of the spray material.

Calcium caseinate, dried milk powder, ordinary skim milk or glue may be used successfully, provided a small quantity of lime is added to it. For each 100 gallons of spray material, it is well to use one pound of commercial casein-lime spreader or two quarts of skim milk to which has been added a couple of tablespoonfuls of lime. Either of these mixtures will overcome the effects of the hard water, according to Prof. Robinson.



The NEW HEAT-TREATED DISKS *on* McCormick-Deering Disk Harrows *hold their edge in any soil*

THE Harvester Company has always put especially durable saw steel into McCormick-Deering disks and every user has benefited accordingly. Now, through careful experimentation the builders have learned to increase the efficiency of the disks *by a heat-treating process which toughens and tempers the steel.*

The new McCormick-Deering disks—heat-treated, crimped-center—are better able to stand the strains encountered in the faster tillage operations made possible by tractor power. They show special ability to hold a cutting edge, even when cutting and cultivating the hardest, rockiest soil.

The *disks* in the harrow take hard punishment! Glance at disk shown at the right. Note the *crimped center*—that means McCormick-Deering. The heat-treated, crimped-center disk in your harrow will mean fewer sharpenings, longer life, better work with less power.

Improve your tillage, lengthen the life of your equipment, put your 1927 crops into better seed beds at the right time—by relying on the thoroughly up-to-date and complete line of McCormick-Deering Tillage Implements. The line includes horse and tractor disk harrows, peg and spring tooth harrows, field and orchard cultivators, rotary hoes and the Dunham Culti-Packer. All sold by McCormick-Deering dealers.

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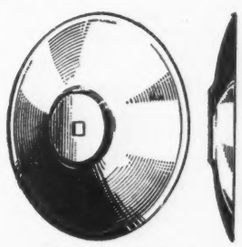


***Be Sure it is a* Heat-Treated Crimped-Center Disk**

Look for the *Crimped-Center*—an *exclusive feature* on *McCormick-Deering Disks.* Over and above the toughening that is now given the disks by heat-treatment, the crimped center adds great durability. It adds 50 to 100 per cent to the strength at the center, and *you can get it only on McCormick-Deering Disk Harrows.*

* * *

You can take one of these new McCormick-Deering heat-treated disks and hurl it edgewise against a hard concrete floor without hurting the edge. You can put it in a vise and spring it out of shape with a large wrench—it will spring back into normal shape at once. *The disk that stands such treatment will stand abuse in the field.*

McCormick-Deering Tillage Tools

Protect your lungs from injurious sprays!

THE chemicals that you use in spraying fruit trees irritate your nose and throat. They may seriously injure your lungs. The only way to protect yourself is to wear a mask.

Dr. Willson's Dust and Spray Mask offers you protection not only when you're spraying, but when you're doing dusty work of any kind. Wear it when you're threshing, treating seed, or engaged in any other dusty occupation.

Dr. Willson's Dust and Spray Mask is easy to adjust and comfortable to wear. Allows free breathing. Ask to see one at your nearest hardware, drug or general store. Priced at $2.25. If your dealer can't supply you, write to Willson Goggles, Inc., Reading, Pa., U. S. A.

DR. WILLSON'S

DUST *and* SPRAY MASK

(*Formerly Dustite Respirator No. 2*)

What price for 1926 Apples?

a heart-to-heart talk with orchardists about more profits from apples.

What price did your apple crop bring last fall? What does it average in bumper years when the supply is superabundant? And what does it average in the off seasons when good prices are offset by poor production and an increase in undergrades? These are the questions the progressive orchardist is constantly asking himself.

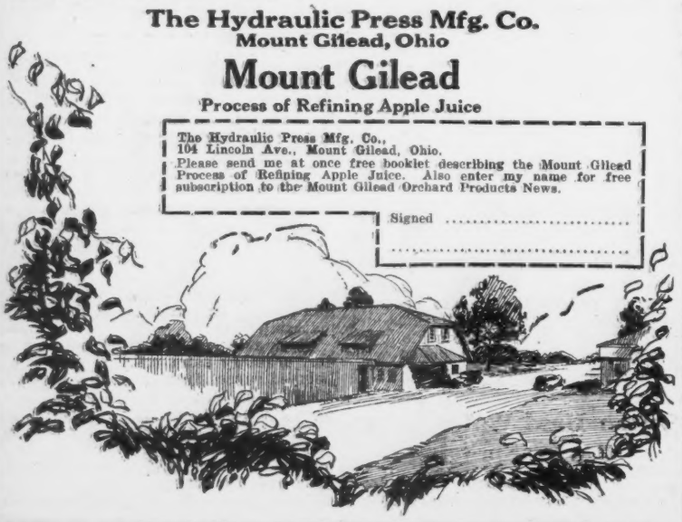
HOW TO ANSWER THEM.

The Hydraulic Press Mfg. Company has lent its aid in time and money to the solution of these problems. It helped in the organization of Apples for Health, Inc., and has subscribed generously to its funds. And as an even greater contribution to the success of the apple grower, The Hydraulic Press organization has developed the Mount Gilead Process of Refining Apple Juice.

This development means that pure, sweet apple juice can now be produced and kept indefinitely without "turning hard"—without losing its delicious, natural flavor—without the addition of chemicals—and without cooking. The production of this pure, healthful food drink with a steady year 'round market supplies the orchardist with a market that will turn his crop into profit-dollars.

Every day more orchardists are beginning to use the Mount Gilead Process as the logical solution to their marketing problems. This process is fully explained and illustrated in a booklet distributed free to orchardists. Every alert orchardist should write at once for a copy of this book and for a free subscription to Mount Gilead Orchard Product News to

The Hydraulic Press Mfg. Co.
Mount Gilead, Ohio


Mount Gilead
Process of Refining Apple Juice
The Hydraulic Press Mfg. Co.,
104 Lincoln Ave., Mount Gilead, Ohio.
Please send me at once free booklet describing the Mount Gilead Process of Refining Apple Juice. Also enter my name for free subscription to the Mount Gilead Orchard Products News.
Signed .....
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Diseases of Raspberries and Their Control

(*Continued from page 7*)

fungus can winter over on old and new canes and has been known to live several years on dead canes. Preventive measures should be followed. Plants free from disease should be used. Old canes should be cut out and burned as soon as the fruit is harvested. Clean cultivation should be practiced and one should avoid wounding the new canes. Insects, especially the snowy tree cricket, play an important part in spreading the disease and should be kept under the most complete control possible.

Orange Rust

Orange rust is caused by a rust fungus. It attacks the black and purple raspberries and is rarely, if ever, found on red varieties. The first symptom of the disease appears in early spring, usually in April or May. Small yellow dots may be observed scattered over the wide surface of the leaves, and a few weeks later, light colored patches appear on the under surface of the leaf, and the epidermis ruptures, exposing large reddish orange patches. Plants affected with rust make a spindling and weak growth and their leaves are smaller than normal. The infected plants do not blossom the following season and the leaves continue to show rust each spring. This disease is spread by spores, which are carried by insects, rain and wind. The fungus winters in the stem and roots of old plants, starting its growth in early spring in the pith of the new growing cane and spreading out into the leaves where it produces the spore masses. The most effective method of control of this disease is to dig and burn the infected plants as soon as the disease can be detected. The grower should also be on the lookout for infected wild brambles growing on his premises and should treat them likewise. Start new plantings with rust-free stock.

Spur Blight

Spur blight, a fungous disease, is not widely distributed in the United States, but it has done considerable damage in Colorado and some other sections. It is common on red raspberries but is rarely found on the purple varieties. The first appearance of the disease usually occurs in July, at which time small purplish brown spots appear on the leaf stalk and on the bark of young canes at the nodes or leaf junction. The buds turn brown and shrivel up, sometimes dying; usually in severe cases the bark splits and becomes very dry. The leaf blades usually fall off, leaving the bare brown stalks on the cane. Sometimes in late season, along in September, black pustules appear on the surface of some of the lesions. The old canes should be pruned out and burned following the harvesting of the berries. Colorado experiments show that Bordeaux 3-4-50 with two pounds of resin fish-oil soap added has given good results. Four applications should be made each year, starting when the young shoots are eight to 12 inches high and continuing at two-week intervals.

Blue Stem

Blue stem is a fungous disease which is serious to blackcaps in the Puget Sound district and some of the central states. The new shoots and fruiting canes show wilting and dwarfing and turn bluish black in color; the fruit dries up and usually the leaves become discolored and wilt; and the old canes become streaked or bluish black in color. The stalks show a dark brown color, and infected roots show reddish brown discoloration. It is believed that the fungus lives in the soil and gains entrance through wounds in the roots or at the base of the plant. All diseased plants should be removed when first observed and growers should avoid replanting raspberries on the same land until a period of at least a few years has elapsed. If possible, avoid planting raspberries on land previously planted to potatoes, tomatoes, cucumbers or eggplant.

Crown Gall

Crown gall is a bacterial disease which is very destructive to the bramble fruit industry. This disease is one of the most serious that growers have to contend with and frequently entire plantations have been destroyed by it. The red and purple varieties are very susceptible, and it is common on the blackcap. The young galls which usually appear at the base of the plant or on the roots are first small, light green in color and somewhat soft; later on, they become very large and turn dark brown in color and are rough and friable. Galls may be distributed over the entire root system and in severe cases may be found on small branches above the ground. When plants are badly diseased with crown gall, the flow of sap is interfered with, and the plant has little value and oftentimes dies. The organism lives in the soil and is believed to gain entrance into the plants through wounds inflicted by insects or mechanical injury. Growers should use only clean stock, and when a plant is observed showing this disease, it should be dug and destroyed. Several years should intervene between bramble fruit plantings on the same site.

The above named diseases are the most common and serious which attack raspberries, and it behooves every grower to become well acquainted with each in order that they may keep them in check.

Points to Be Considered by Raspberry Growers

1. Procure only clean, healthy, true-to-name nursery stock, and demand that it be doubly inspected each year by efficient inspectors.
2. Set the plant while it is in the dormant stage and remove the attached stubs of old canes when setting blackcaps.
3. Use plants that come from young plantations.
4. Rotate crops—avoid replanting of raspberries until a period of three years has intervened.
5. Practice good culture with careful cultivation at the proper time.
6. Remove and burn old canes following the harvest of the crop.
7. Destroy wild brambles.
8. Thorough spraying controls many serious pests and diseases (except virus diseases).
9. Keep a very attentive eye for diseased plants; dig and burn such plants as soon as they are observed.
10. Practice careful pruning.

Excellent information on raspberry diseases can be secured from the following bulletins: United States Department of Agriculture Farmers' Bulletin No. 1488, Washington, D. C., and University of Illinois Agricultural College and Experiment Station Circular No. 305, Urbana, Ill. A technical bulletin entitled "Virus Diseases of Raspberries," by Dr. C. W. Bennett, Michigan State College, East Lansing, Mich., is in press and can be secured by applying to the Michigan State College Experiment Station, East Lansing.

(Dr. C. W. Bennett of Michigan State College kindly furnished the pictures to illustrate this article.)

FORTY-FIVE pecan growers in DeWitt county, Texas, have organized the Guadalupe Valley Pecan Growers' Association. The price of pecans is said to have jumped from eight and one-half cents to 12 cents a pound immediately after the organization was formed. On December 15, 1926, six cars of pecans had been shipped, mostly to northern pecan shellers.

Mr. Levy brought a bowl of gold fish home to his boy, Abie, and the following brief and illuminating colloquy ensued:

"A B C D goldfish."

"L M N O goldfish."

"O S A R."

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Engineering for the Fruit Grower

By E. W. Lehmann

Stationary Spray Equipment

DURING the last few years, there has been considerable interest in stationary spray plants, especially in the West, where many of the orchards are relatively small and where the practice of irrigation is necessary. There has been more investigational work done on this subject by the California and Washington experiment stations than by any other stations. It is also true that there are more stationary spray plants in use in these two states than in others.

The following summary and conclusions are quoted from a new bulletin that has just been published by the California Experiment Station, Davis, Calif.

"A stationary spray system consists of a central pumping station and pipe lines laid systematically throughout the orchard, with outlets at regular intervals, to which hose are attached for spraying the trees.

"The first stationary spray plant was used by Hayward Reed, in 1908. There are today about a dozen such systems in California, the orchards ranging in size from 19 to 260 acres, while in the state of Washington there are several hundred plants in orchards from three to 160 acres in size.

"The advantages of stationary spray plants are many, but the principal ones are that spraying may be done on time in spite of adverse soil or weather conditions, and that pests requiring quick action may be speedily controlled. Thorough spraying may be accomplished with a saving of labor and time, with a low operating cost and low fixed charge. Other advantages are:

"a. It is possible to irrigate and spray at the same time.

"b. Spraying is possible with a minimum danger of knocking off or bruising the fruit on low hanging branches.

"c. Props offer little interference to spraying.

"d. Hillside orchards may be sprayed easily.

"e. Intercrops or permanent cover crops are not injured, since tractors and teams are not required.

"f. Men are separated so that they do not spray each other.

"g. Electric energy may be used, which is more convenient than gasoline power.

"h. Ninety-five per cent of the time is used in spraying and no time is lost in refilling.

"i. The system is a permanent improvement to the property.

"The disadvantages are:

"a. Initial cost is high. This is not a great disadvantage, however, considering the long life of the installation.

"b. All dependence is placed in one plant.

"c. The system is limited to the extent of the pipe lines.

"d. There is some possibility of materials settling in the pipes. With mains of proper size and with sufficient nozzles in operation to maintain velocity, this difficulty becomes negligible.

"e. There is a possibility of damage to the system during cultivation, especially when subsoiling.

"f. There may be corrosion of the pipes and fittings. Proper flushing after each spraying minimizes this difficulty.

"g. Some spray material is wasted during flushing.

"h. There is loss of pressure due to friction in long pipes and hose, thus necessitating high pump pressures."

There is a possibility of combining the advantages of the portable sprayer and the stationary spray plant by piping sections of the orchard that would be benefited and using the portable sprayer for supply and power. In other words, the portable rig becomes the pumping station for the permanent piping system and at other times is available for spraying parts of the orchard where there is no pipe line. Some growers are actually using this combination to good advantage. Other growers lay the piping system on top of the ground, but this method is suggested only as a temporary measure.

This bulletin further states that the installation costs supplied by the owners ranged between $29.21 and $106.19 an acre. The latter figure is exceptionally high because the cost of rebuilding the plant after its destruction by fire was included. A fair average seems to be $37.50 an acre. Operating costs for a single application varied from $5.04 to $12.69 an acre, or 0.7 to 3.7 cents per gallon of spray. This cost depends upon the kind of spray used, the amount per tree, the rate of application, and the efficiency of the plant. These figures include all labor, material, power and repairs.

Protecting Shallow Wells

THE STATE of Illinois, through its Department of Public Health, Division of Sanitary Engineering, has been inspecting and tagging its semi-public water supplies during the past summer, special attention being given to tourists' camp grounds. All water supplies meeting the requirements of the inspector are tagged with a "Safe Water Supply" tag.

This is a commendable piece of work because of the important part a good water supply plays in improving health conditions. Every person who uses water from a shallow well should realize that adequate protection is the first requirement for a safe supply. It is useless to have a supply tested that is not properly protected, because it may be safe today and contaminated tomorrow.

Good surface drainage, a tight curb extended above the surface of the ground, a tight concrete top constructed so that no water can get back into the well once it has been pumped out, are some of the requirements that should be kept in mind. A concrete platform around a well, designed to drain the water away from the top of the well, is a good thing.

Hot Water for the Farm Home

IT IS always a joy and a satisfaction to have plenty of hot water in the home when it is needed, whether for a bath or on wash day. With gas or electricity available, the job of heating water is made easy, but it is rather expensive. During recent years many efficient and less expensive methods of water heating have been developed for use in the country.

The first step in making hot water available at all times is to provide at least a simple plumbing system, such as has been described in an earlier issue of this magazine. A complete system of plumbing would, of course, be more desirable.

A pipe coil in a furnace or a hot water back in the range provides a means of heating water for at least part of the year. During the summer, when neither the range nor the furnace are in use, some other means must be provided.

The kerosene water heater is quite efficient and not very expensive. There are a number of makes of kerosene heaters on the market. All of them work on about the same principle. A heating coil, usually made of copper, is provided, and it is heated by a regular kerosene burner of either the wick or the wickless type. The coil and burner are surrounded by a jacket. The cost of heating water with a kerosene water heater is considerably less than heating it with gas or electricity at ordinary prices.

During recent years, a number of liquid gases have been brought on the market which make possible a means of water heating comparable with city gas but at somewhat more expense. The gas is bought in liquid form in a container, usually under pressure. Before purchasing such equipment, be sure it has been approved by the Board of Fire Insurance Underwriters.

No doubt one of the best and most practical means of water heating on the farm is to use one of the small jacketed, coal burning hot water heaters. In this type of heater, the water entirely surrounds the fire box. The top of the heater is the same as a regular four-hole laundry stove and can be used for canning, cooking or for other purposes.

Buy only the best grade of trees when ordering nursery stock this spring.

Scalecide Is Guaranteed To Make a Better Orchard Than Lime-sulfur

WE GUARANTEE that, if you will divide an orchard your worst or best, in two parts equal in general condition, and for three years spray one part with Scalecide according to our directions and the other part with lime-sulfur, giving the same Summer treatments to both parts, the part sprayed with Scalecide will be better than the part sprayed with lime-sulfur—in the judgment of three disinterested fruit growers—or we will refund the money you have paid for the Scalecide

It Protects Stark Bros. $5000 Tree

Stark Bros. cannot afford to take any risk with the original Golden Delicious tree, so they enclose it in a burglar-alarm cage and spray it every year with Scalecide—the complete dormant spray

It Is Pleasant To Use

You could swim in Scalecide—it is so *pleasant* to use. It does not injure even the eyes. You can look straight at your work. Why use a caustic, disagreeable spray when you can use Scalecide and do better work, at less cost, with comfort?

It Is Complete—Nothing To Add

Scalecide *alone* does all that any combination of dormant sprays can do. It controls scale (fall or spring). It controls aphis and pear thrips without nicotine (delayed dormant). It controls leaf roller and European red mite (delayed dormant) neither of which is controlled by lime-sulfur even *with* nicotine. It controls pear psylla (fall or early spring). It controls bud moth (fall or spring). In addition to all these things, the annual use of Scalecide controls some forms of fungous cankers, and invigorates the trees.

Save Money By Using Scalecide

A 15-gallon drum contains enough Scalecide to spray, until they drip, the same trees as one 50-gallon barrel of lime-sulfur. Neither nicotine nor spreader is required. Moreover, Scalecide saves you half the labor of spraying. Go to your dealer and arrange for your supply of Scalecide today. If your favorite dealer doesn't have Scalecide show him this advertisement—or order direct from us (see prices to the right).

Drum $2 extra: returnable

Scalecide Prices

Freight Paid East of the Mississippi

50-gal. bbls.	$38.00
15 gals.	11.50
Drum (returnable)	2.00 / 13.50
1–10-gal. can	10.60
1–5-gal. can	6.25
1–1-gal. can	1.75
1–1-quart can	.75

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SCALECIDE

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Against Climbing Insect Pests

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Outlasts all Substitutes

One pound makes 12 lineal feet of band three-inches wide. It remains effective three to four months, *outlasting all substitute materials from 10 to 20 times.*

Tree Tanglefoot is quickly and easily applied with a wooden paddle. For tree surgery nothing equals this material. It waterproofs crotches, wounds and cavities when nothing else will. Leading horticulturists everywhere endorse it. Seed, hardware and drug stores sell it. Prices: 25-lb. pail $11, 10-lb. can $5.25, 5-lb. can $2.75, 1-lb. can 60 cents.

(85) *An illustrated book on leaf-eating insects sent free on request*

THE TANGLEFOOT COMPANY
GRAND RAPIDS, MICHIGAN

TREE TANGLEFOOT

Orchard Spray Progam

By Leroy Childs, Hood River Experiment Station, and

On account of the climatic differences existing in the more humid orchard sections west of the Cascade Mountains and the semi-arid and irrigated regions east of this range, the conditions as to pests and diseases are different and require a somewhat different spray program. In general, there are a greater number of diseases and pests to be sprayed for in western Oregon, Washington and British Columbia than in the drier orchard sections of the interior. Hence, the full spray program for the section west of the Cascades will be presented and then followed by paragraphs outlining the program for other sections.

SPRAY PROGRAM I

For humid sections of Washington, Oregon and British Columbia west of Cascades

APPLES AND PEARS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. As winter buds swell just before opening.	Lime-sulphur 12 gal., water to make 100 gal.; or miscible oil 8 gal., water to make 100 gal.	San Jose scale, blister mite, spider mite.	Use Dormoil 8 or 10 gal., water to make 100 gal., as green tips emerge when leaf roller is present.
(2) Pre-pink spray. Cluster buds open just enough to expose blossom buds.	Lime-sulphur 3½ gal., water to make 100 gal.	Scab and powdery mildew.	If anthracnose is under good control, use 6-6-50 Bordeaux here instead of summer spray. Add ¾ lb. nicotine sulphate to 100 gal. spray when aphids are present.
(3) Pink or pre-blossom spray. Just before blossoms open.	Lime-sulphur 2½ gal., water to make 100 gal.	Scab and mildew.	For fruit worms and bud moth, add 3 lb. lead arsenate to 100 gal. spray.
(4) Calyx spray. As last petals fall. Before apple calyx closes on central fruit in cluster.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal. (see footnote 2.)	Scab, mildew, codling moth on apple, fruit worm on pear.	To control moderate leaf roller infestation, use double quantity lead arsenate.
(5) Fifteen-day spray. About 15 days after petals fall.	Lime-sulphur 2 gal., water to make 100 gal. (see footnote 2.)	Scab, mildew.	Add lead arsenate 2 lb. to 100 gal. spray for pear slugs.
(6) Thirty-day or first cover spray for worms. Three to five weeks after petals fall.	Arsenate of lead 2 lb., water 100 gal.	Codling moth.	Add wettable sulphur (see General Remarks) for scab and mildew.
(7) July spray. July 10 to 25, depending on locality and season.	Arsenate of lead 2 lb., water 100 gal.	Codling moth, second generation.	For anthracnose canker use 4-4-50 Bordeaux.
(8) August spray. August 10 to September 5, depending on season and locality.	Arsenate of lead 2 lb., water 100 gal.	Codling moth.	May usually be omitted on pear.

PRUNES AND PLUMS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. As winter buds are ready to open.	Lime-sulphur 12 gal., water to make 100 gal.	San Jose scale, spider mite, twig miner.	If scale is absent, use only 8 gal., water to make 100 gal.
(2) Pre-blossom spray. Buds white just before opening.	4-4-50 Bordeaux with spreader; or lime-sulphur 3 gal., water to make 100 gal.	Brown rot blossom blight.	For aphids, use nicotine sulphate ⅝ lb. in 100 gal. For bud moth use arsenate of lead 2 lbs., lime 2 lb., in 100 gal.
(3) First fruit spray. As soon as shucks fall.	Wettable sulphur (see General Remarks).	Leaf spot, brown rot.	
(4) and (5) About June 1 and July 1.	Spray with wettable sulphur (see General Remarks); or dust with sulphur.	Leaf spot or brown rot if troublesome.	
(6) August spray. About a month before harvest.	Spray with wettable sulphur (see General Remarks); or dust with sulphur.	Brown rot.	

PEACHES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Leaf curl spray. From December to mid-February.	6-6-50 Bordeaux.	Peach leaf curl.	
(2) Late dormant spray. Just as first buds are ready to open.	Lime-sulphur 12 gal., water to make 100 gal.	Peach twig miner, San Jose scale, spider mite.	If scale is absent, use 8 gal. lime-sulphur in 100 gal. For bud moth, add arsenate of lead 2 lb., lime 2 lbs., to 100 gal. spray.
(3) First fruit spray. As soon as shucks fall.	Wettable sulphur (see General Remarks).	Peach blight (fruit spot), mildew, brown rot.	If disease condition is bad, repeat at 2- or 3-week intervals.
(4) Late summer spray. About 6 weeks before harvest.	Spray with wettable sulphur (see General Remarks); or dust with sulphur.	Brown rot.	
(5) Early fall spray. As soon as each variety is picked.	4-4-50 Bordeaux.	Peach blight, die back.	For young trees or trees with no crop, apply in August.

CHERRIES

For San Jose Scale—Same as No. 1 in prune program.

For Aphids—Use nicotine sulphate 1 lb. to 100 gal. with pre-blossom spray (same as No. 2 for prune). Use tanglefoot bands on trees to prevent reinfestation of aphids by ants.

For Syneta Beetle—Use lead arsenate 4 lb., lime 2 lb. in 100 gal. water. The first year Syneta control is applied, put on this spray just before and just after blossoming; in succeeding years before bloom only.

For Cherry Fruit Maggot—Use the following sweetened poison spray for adult flies; lead arsenate ½ lb., syrup 2 qts., water 8 gal. Apply about 1 qt. to the tree, spraying the upper surface of the outer leaves only, when adult flies appear. This will be from June 8 to 20. Repeat application 10 days later and give a third spray 1 week after second.

For Brown Rot (Monilia) Blossom Blight—Same as No. 2 in prune program.

For Cylindrosporium Leaf Spot (Yellow Leaf)—Same as Nos. 3, 4 and 5 in prune program.

For Brown Rot on Fruit—Use a wettable sulphur spray or sulphur dust 1 month before picking. Begin earlier if disease shows up sooner and repeat every 2 or 3 weeks till a month before picking.

APRICOTS

For Brown Rot (Monilia) Blossom Blight—Same as No. 2 in prune program. Where blossom blight has become very severe and in very wet springs, a similar spray may be desirable as the winter buds open, and another about in full bloom. Prune out and destroy all dead twigs and spurs in winter.

For Fruit Spot (Peach blight fungus)—Same as Nos. 3 and 5 in peach program.

San Jose Scale and Other Insects—Same control as for similar insects on peach

for the Pacific Northwest

H. P. Barss, Oregon Agricultural Experiment Station

SPRAY PROGRAM II

For semi-arid sections of the Northwest east of Cascade Range and for Rogue River Valley in Oregon.

APPLES AND PEARS

Scab—Present and troublesome only in a few localities. Where sufficiently abundant to justify spraying, apply Nos. 3 and 4 in Program 1 for apples and pears.

Powdery Mildew—Use applications Nos. 2, 3, 4 and 5 in Program 1 for apples. Continue if necessary. Observe footnote 2. Use casein spreader first dissolved in water. Supplement by winter and summer pruning out. Pink spray most important to avoid sulphur shock.

Codling Moth—Following the calyx application, the first cover spray (15 to 30 day) is applied just before the first worms hatch. In general, this will be earlier for interior (15 days) than for coast area. Follow with second cover spray 2 weeks after first cover spray; third cover spray, 4 weeks later; and fourth cover spray, 4 weeks after third.

For southern Oregon an additional late cover spray may be necessary. Double strength lead in late sprays advisable. Calyx spray on pears likewise advisable in southern Oregon.

For eastern Washington, northern Idaho and the Grande Ronde Valley of Oregon, follow Program 1, although in higher altitudes probably two cover sprays will generally suffice.

Citrus Red Spider—Use spray No. 1 in Program 1.

Blister Mite—Use spray No. 1 in Program 1. For apple see footnote 6.

Leaf Rollers, Fruit Worms, San Jose Scale, Aphids—Follow Program 1 for these insects.

PEACHES

Leaf Curl, Mildew and California Blight, Twig Miner, San Jose Scale, Spider Mite—Follow Program 1 for these diseases and insects.

CHERRIES

Practically no fungous diseases requiring spray. Insects in general would require no regular program of sprays. For specific pests follow Program 1 for cherries.

APRICOTS

California Blight—Follow Program 1 for peach blight. Insect pests and treatment same as for peaches in Program 1.

PRUNES AND PLUMS

No fungous diseases requiring spray as a rule.

San Jose Scale, Twig Miner and Spider Mite are principal insect pests. Where present, control with spray No. 1 in Program 1 for pruns and plums.

FOOTNOTES

1. **Where aphids are very bad**, especially with varieties somewhat resistant to scab, omit nicotine from application No. 2, adding it to application No. 3, which should then be applied just as soon as the blossom buds separate from each other. For severe infestations of brown aphids, the most satisfactory spray used in the Hood River Valley has been the oil spray applied as indicated in application No. 1 just as the buds begin to show green. However, if blister mite is present, see footnote 6.

2. Lime-sulphur will russet the skin of some varieties of pears like d'Anjou, Comice and Howell, and may cause burning of apples in hot weather. Under such circumstances substitute wettable sulphur spray. See General Remarks.

3. **Codling moth control is such a complex problem and of such outstanding importance that too much dependence should not be placed upon a general spray program of this nature. Supplement the suggested program with all the trained assistance and advice obtainable. The most important period in codling moth control begins with the calyx spray and extends for 4 or 5 weeks thereafter. Where worm losses have been heavy, keep fruit thoroughly covered during this period as first brood worms are very active and the fruit rapidly loses its protective coating because of rapid growth. Because growers must eliminate arsenical residue on fruit for shipment, they should take extra care to control the first brood, giving an extra spray if necessary. No arsenical should be applied after mid-July, unless the worm situation positively requires it. The late cover spray may usually be omitted on pear. Supplement the spraying by careful collection of wormy fruit at thinning time; it pays. Scrape the scaly bark from the trees during February and March, band the trees in June, and destroy the accumulated worms every 2 weeks. For bad worm infestations, use 4 lb. lead arsenate to 100 gal. throughout the season. Codling moth is not a commercial orchard pest of British Columbia, and no program of control is required.**

4. **Anthracnose** or black spot canker and fruit rot may be successfully prevented by a single thorough summer application of 4-4-50 Bordeaux. Where the disease is reasonably well under control 6-6-50 Bordeaux in application No. 2 is of much value in reducing infection without the disadvantage caused by the coating of the fruit with Bordeaux in the summer. The spring Bordeaux spray, however, must be applied before the fruit buds are much exposed, to avoid russeting. Bordeaux 6-6-50 applied with the oil spray is also proving of great value in the Hood River district in reducing anthracnose. In filling tank, add lime first. Fill tank two-thirds full; slowly add dissolved bluestone, lastly add oil, which, before adding, should be stirred up and emulsified with an equal amount of water. A very thorough application is necessary, as this spray must stay on the trees until fall, at which time it becomes effective in controlling the disease.

5. **Leaf rollers** occur as a major pest only in certain of our fruit sections. Oil emulsion in the early pre-pink (delayed dormant) is the standard spray. Dormoil has given uniformly better results in leaf roller control than other western oils. Some miscible oils are apparently of little value in control. Where conditions develop that prevent maximum effectiveness from the oil spray and for very light infestations of leaf roller, use double strength lead arsenate (4 to 100) in the pink and calyx sprays.

6. **For blister mite** on apple, apply lime-sulphur 10 to 100 (12 to 100 if the scale is present) any time after trees go dormant in the fall or in the spring before buds begin to open. Control cannot be obtained after green begins to show on buds. Oil 8 to 100 is effective during a much more limited time; this period is between the time scales are separating on buds and before green tips show. Warm, sunny weather greatly assists in increasing control. Every bud in the tree must be hit with the spray material, as the mites over-winter in the buds.

7. Three species of red spiders are troublesome in the apple and pear orchards of the Northwest. In some sections all are present, in others one or two of the three are present. Control measures for two are alike but for the third species a different recommendation must be made. On account of this situation, it is necessary to know the particular spider giving trouble. The so-called European red spider and the brown mite over-winter in the egg stage on the tree. The third species, or so-called common red spider, hibernates in trash on the ground and is not on the trees when the first spray is applied. Oil spray at the rate of 3% or more is recommended for the first two species indicated. For the common red spider, the usually recommended sulphur sprays applied during early spring are quite effective. If all three of these pests are troublesome in the summer, a weak oil spray containing ½ to ⅝% of lubricating oil is recommended.

GENERAL REMARKS

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing about 32 degrees Baume.

Where the powdered or "dry lime-sulphur" is used, it will take about 4 lb. of the dry powder to equal in active ingredients 1 gal. of the standard concentrated liquid lime-sulphur. For example, where this program recommends "lime-sulphur 12 gal., water 100 gal.," the grower employing the dry form should use 48 lb. of the dry lime-sulphur with every 100 gal. of water to get the same strength of spray.

Wettable Sulphur Sprays—Within recent years substitutes for lime-sulphur have been devised which do not have the caustic or burning action of the latter and hence are safer to use on tender-skinned varieties of pears and apples and on stone fruits. These sprays are not very active as fungicides or insecticides when the weather is cool and hence cannot always be relied upon for effective action in the early spring. They are, however, active in warm weather. It is usually advisable to employ a soap or casein spreader with them unless a spreader is used in the composition. These spray materials are much easier to prepare or use than the old self-boiled lime-sulphur and are to be recommended wherever the latter has been advised in the past. Among these wettable sulphur sprays may be mentioned the well-known atomic sulphur (use 12 lb. to 100 gal.), "dry-mix" sulphur and lime, and "Oregon cold-mix" lime and sulphur. To prepare the latter, use superfine sulphur 16 lb. and hydrated lime 8 lb. Mix together (thoroughness not required). Pour into the mixture 4 qt. milk (skimmed is entirely satisfactory) and stir into a smooth paste, adding water if too thick, and finally pour through strainer into spray tank with enough water to make 100 gal. with the amounts of materials mentioned. Other satisfactory materials are now no the market.

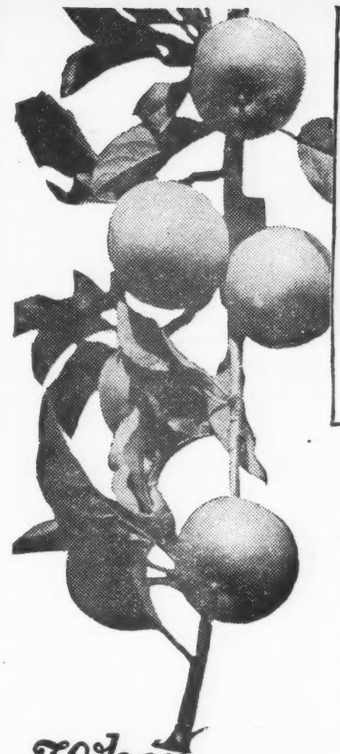
Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

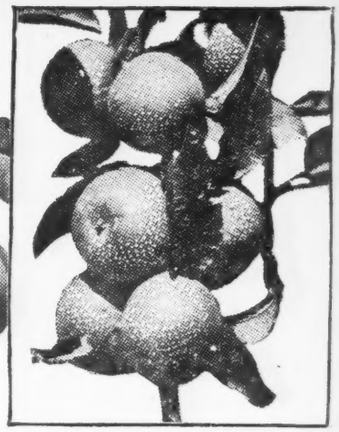
Oil Sprays—Oil sprays are increasing in popularity throughout the country. Up to the present time, however, observations made in Oregon at least do not seem to indicate that an oil emulsion of less than 6% should be recommended for the control of San Jose scale. Some growers, after using oil for several years at the above strength, are going back to the use of lime-sulphur. Probably some unknown factors are influencing results obtained in different parts of the country.

Spreaders—Materials like calcium caseinate added to sprays to increase their spreading powers have not given increased control with such troubles as codling moth or scab.

Dusting—Dusting sulphur has given promising results in warm weather for mildew and brown rot control, but is not as active as ordinary lime-sulphur in cool weather as in early scab applications. No dusting material has thus far given as good results as liquid sprays for anthracnose, peach blight and other diseases requiring long, wet weather protection. The relative value of dust and spray for the control of insect pests cannot be stated exactly without further experimental work.

Spray Combinations—Any of the materials mentioned in this spray program in connection with any particular application may be successfully combined, but it is best not to add lead arsenate to a tank of diluted lime-sulphur until the last thing before staring to spray.





ABOVE: Arsenate of lead *without* KAYSO: note uneven coating.—AT LEFT: Arsenate of lead *with* KAYSO.

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A CASEIN SPREADER
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Every grower who has been following government bulletins and farm journals for the past few years has learned the value of adding a Casein Spreader to the spray. Without a spreader, the ordinary spray mixture is deposited *in drops*, and leaves much of the surface exposed to insect pests and fungus diseases. And a spotty spray often causes blotches that lower the grading of the fruit.

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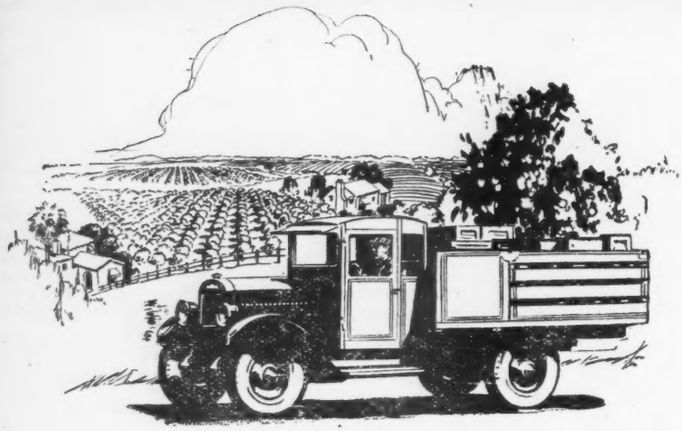

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REO MOTOR CAR COMPANY, *Lansing, Michigan*

General Spray Table

By W. B. Lanham.

APPLES AND PEARS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) After leaves have fallen and until growth starts in the spring.	Lime-sulphur 11 gal., water to make 100 gal.; or oil emulsion (see General Remarks).	San Jose and other scale insects.	
(2) When 90 to 100% of petals have fallen; rush to completion.	Arsenate of lead 4 lbs., nicotine sulphate 1 pint, water to make 100 gal.	Codling moth, plant lice, curculio, biting insects.	The most important application for codling moth.
(3) Eighteen days after No. 2.	Arsenate of lead 4 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, blotch, curculio, biting insects.	
(4) Six weeks after No. 3.	Arsenate of lead 4 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, blotch, curculio, biting insects.	
(5) Three weeks after No. 4.	Arsenate of lead 4 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, blotch, curculio, biting insects.	
(6) Three weeks after No. 5.	Arsenate of lead 4 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, blotch, curculio, biting insects.	

PECANS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant season.	Oil emulsion (see General Remarks).	Obscure scale.	
(2) When first larvae are seen after nuts are set.	Arsenate of lead 6 lb., water 100 gal.	Nut case bearer.	Add 3 lb. lime if water contains sulphur.
(3) After growth starts and during humid weather.	4-4-50 Bordeaux.	Scab.	
(4) When first worms appear.	Arsenate of lead 4 lb., water 100 gal.	Webb worms.	

GRAPES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) After leaves have fallen and before growth starts in the spring.	4-4-50 Bordeaux.	Black rot, mildew.	
(2) When leaves are out 4 to 6 in.	Arsenate of lead 4 lb., 4-4-50 Bordeaux 100 gal.	Black rot, mildew biting insects.	
(3) Ten days to 2 weeks after No. 2.	Nicotine sulphate 1 pint, 4-4-50 Bordeaux 100 gal.	Black rot, mildew biting insects, sucking insects.	
(4) Two weeks after No. 3.	4-4-50 Bordeaux.	Black rot, mildew.	
(5) Two weeks before harvest if necessary.	4-4-50 Bordeaux.	Black rot, mildew.	

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 32 degrees Baume.

Oil Emulsion—Either of the following two formulas for making oil emulsion may be employed in making the above spray mixtures:

Cold Stirred Emulsion Stock Solution

Fish-oil soap (preferably liquid)	8 lb.
Paraffin oil	2 gal.
Water	1 gal.

The soap should be placed in a receptacle in which the emulsion is to be made. A pint of oil should be added and stirred vigorously until no free oil is visible. This should be continued until the required amount of oil is used and completely emulsified. The water should then be added slowly in the same manner. This stock solution should be diluted with 200 gal. of soft water, or 1 gal. of this stock solution should be used to 50 gal. of soft water.

Boiled Emulsion Stock Solution

Fish-oil soap (1 gal. liquid)	2 lb.
Paraffin oil	2 gal.
Water	1 gal.

Mix the ingredients together and heat to the boiling point. Then emulsify by pumping and repumping the mixture into itself. Merely stirring is not sufficient. A hand spray or barrel spray pump will serve the purpose. If the solution is too thick at the time it is to be used, bring it to a warm temperature but do not boil. This amount of stock solution should be diluted with 200 gal. of water.

Soda-Sulphur Solution—The following directions for making soda-sulphur stock solution are taken from Farmers' Bulletin 933:

Apple Tent Caterpillars

APPLE tree tent caterpillars are unusually abundant in the area from the Connecticut River Valley westward into New York state and southward to Virginia, according to the Department of Agriculture. Wild cherry trees are seriously defoliated and unsprayed apple orchards rather severely injured.

The familiar tentlike nests of silk seen in neglected orchard trees and along roadways and fences are the early homes of these pests. They feed on nearby foliage until full grown. When the caterpillars are very abundant, the trees become so completely stripped of their leaves that the pests are forced to hunt elsewhere for food, and hence they are often seen crawling in great numbers over the ground, fences and buildings. It is this migration to houses, porches and sidewalks that is most objectionable to the average citizen.

There is only one brood of larvae each year, and after the spring visitation no further annoyance will be experienced during the season. Ordinarily the many natural enemies of the pest hold it well in check, but when these are inactive the caterpillars become very abundant.

Ordinary spraying in the spring with arsenate of lead controls the pest in orchards. On roadside and waste trees the nests may be destroyed by hand or with rags saturated with kerosene and fastened to a long pole. The use of a torch to burn out the nests will often be found convenient. Notable community work has been done by school children in searching out and destroying the egg masses on twigs of trees early in the spring.

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for the Southwest

Texas Agricultural Experiment Station

PEACHES, PLUMS AND APRICOTS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) After leaves have fallen and until growth starts in the spring.	a. 4-4-50 Bordeaux. b. Oil emulsion (see General Remarks).	a. Peach leaf curl. b. San Jose scale alone.	Both peach leaf curl and scale may be controlled with lime-sulphur 11 gal., water to make 100 gal.
(2) When two-thirds of the shucks are off.	Arsenate of lead 4 lb., 8-8-50 self-boiled lime-sulphur 100 gal.; or arsenate of lead 4 lb., wettable sulphur 100 gal. (see General Remarks).	Brown rot, curculio, scab, biting insects, leaf spot.	
(3) Seven to 10 days after No. 2.	Arsenate of lead 4 lb., 8-8-50 self-boiled lime-sulphur 100 gal.; or arsenate of lead 4 lb., wettable sulphur 100 gal. (see General Remarks).	Brown rot, curculio, scab, leaf spot, biting insects.	
(4) About 4 weeks before ripening.	Self-boiled lime-sulphur; or wettable sulphur (see General Remarks).	Brown rot, scab, leaf spot.	
(5) October 1 to 15 and March 1 to 15.	Paradichlorobenzene in soil (see U. S. Dept. Agr. Bul. No. 1169).	Borers.	
(6) Fall and winter.	Dig worms out.	Borers.	

CITRUS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) December and January.	Oil emulsion (see General Remarks).	Scale insects.	
(2) When two-thirds of petals have fallen.	Lime-sulphur 1½ gal., nicotine sulphate 13 oz., water to make 100 gal.	Red spider, thrip, rust mite.	
(3) When fruit is about 1 in. in diameter.	Soda-sulphur 2 gal. (see General Remarks), oil emulsion 1½ gal. (see General Remarks), water to make 100 gal.	Scale insects, rust mite, red scale.	
(4) Ten to 14 days after No. 3.	Spray with lime-sulphur 1½ gal., water to make 100 gal.; or dust with sulphur.	Rust mite, red spider.	
(5) July or August.	Spray with lime-sulphur 1½ gal., water to make 100 gal.; or dust with sulphur.	Scale insects, rust mite, red spider.	

FIGS

Time of Application.	Materials to Use.	For Control of.	Remarks.
Just after growth starts. Repeat every 3 or 4 weeks as needed.	5-5-50 Bordeaux.	Rust.	

"The main value of the soda-sulphur solution consists in the properties which enable it to be used in combination with the oil emulsions. Owing to the superiority of lime-sulphur solution, the use of soda-sulphur solution alone is not advised. It has a distinct place, however, in forming a good combination spray for white flies, scale insects and mites. It is made as follows:

Stock Solution Formula

Flowers of sulphur	30 lb.
Caustic soda (98%)	20 lb.
Water	20 gal.

"To remove the lumps from the sulphur, place a wire screen over the barrel and rub the sulphur through with the hands, then slowly add about 3 gal. of water and stir so as to form a thin paste. The caustic soda should then be added and the entire mixture stirred vigorously. Some growers add the caustic soda gradually to prevent too vigorous boiling, and others add it all at once with water enough to prevent too vigorous boiling. It is also practicable to dissolve the caustic soda in about 4 gal. of water before it is added to the sulphur. The boiling will be quite violent and it may be necessary to add a gallon or more of water during the process, but whether or not this is necessary can be determined by the operator.

"The main difficulty in making this formula is that too great heat is generated, which liquifies the sulphur before it can be acted on by the caustic. If sediment forms, this has been the cause. To prevent this excessive heat, add more water in the beginning and during the process. After boiling has ceased, add about 16 gal. of water.

"For spraying against red spiders and rust mites, use 1 gal. of this stock solution to 40 gal. of water. When used with the oil sprays, the strength should be a little weaker than if used alone. When so used, dilute 1 gal. to 50 gal. of water. If it is to be used in combination with oil emulsion, it should be added to the tank or barrel of water before the oil emulsion."

To make the soda-sulphur solution combination as given in the spray schedule, add 1½ gal. of the oil emulsion to 100 gal. of the diluted solution.

Wettable Sulphur—Wettable sulphur is made from 8 lb. hydrated lime, 16 lb. superfine sulphur and 1 lb. calcium caseinate to 100 gal. water. The materials can be mixed dry in advance and stored for use. In preparing the spray mixture, proceed as follows: Fill the tank half full of water. Then with agitator running, add the dry material slowly and direct the spray nozzle upon the material until it has disappeared in the water.

Grape Root-Worm

EXTENSIVE tests made by the New York State Experiment Station at Geneva in the grape districts in Chautauqua county with poison dusts and sprays for the grape root-worm have shown that dusting is not as effective a measure of control as spraying with Bordeaux mixture and lead arsenate, according to a report of the tests now available for free distribution to grape growers troubled with this pest.

"No dust at present offered for sale will control the grape root-worm, because no dust preparation now available will stick to the foliage of Concord grapes," say the station specialists. "For this reason, also, dusts failed to check powdery mildew, a serious disease of grapes which Bordeaux spray controls effectively.

"Dusting has a decided advantage over spraying in that it is possible to dust a vineyard about two and one-fourth times as rapidly as to spray, resulting in a considerable saving in labor costs. If a dust can be produced which will stick to grape foliage and which will effectively control grape root-worm, and if such a dust could be sold at not more than $8.50 per 100 pounds, it would be good economy for grape growers to dust. Until such a dust is put on the market and thoroughly tested, however, the regular routine spray will be found much more satisfactory.

"The Bordeaux spray mixture which has given the best results in the station experiments contains eight pounds of copper sulphate, eight pounds of lime, three pounds of dry arsenate of lead and three pounds of resin fish-oil soap to each 100 gallons of spray mixture. Applied with the usual type of vineyard sprayer, it will take from 125 to 150 gallons of this mixture to treat an acre."

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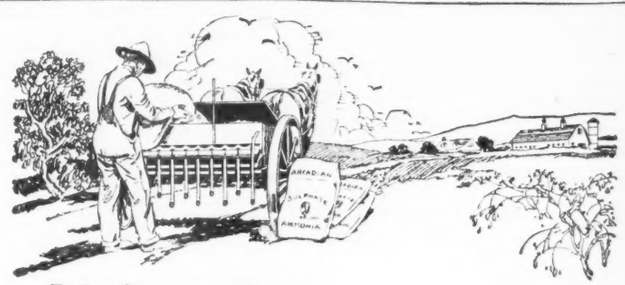

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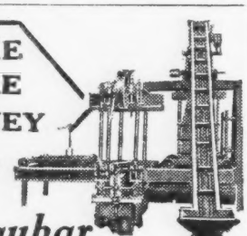

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Spraying and Dusting

By Oliver I. Snapp, Bureau of Entomology,

SPRAYING PROGRAM FOR PEACHES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lubricating oil emulsion 3% (see General Remarks); or lime-sulphur 11 gal., water to make 100 gal. When oil emulsion is used, add 4-4-50 Bordeaux for peach leaf curl in sections where prevalent.	San Jose and other scale insects, leaf curl.	Lime-sulphur solution should not be used on peach trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals (pink part of flower) have fallen.	Arsenate of lead 2 lb., lime water from 6 lb. unslaked lime, water to make 100 gal.	Curculio.	If hydrated lime is used instead of unslaked lime, use 8 lb. to 100 gal. water.
(3) When calyces or "shucks" are shedding or when small peaches are exposed. This is usually about 10 days after the petals fall.	Arsenate of lead 2 lb., lime water from 6 lb. unslaked lime, water to make 100 gal.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 8 lb. to 100 gal. water.
(4) Two weeks after the third application, or about 4 weeks after the petals have been shed.	8-8-50 self-boiled lime-sulphur. (No arsenate of lead is used in this application.)	Scab, brown rot.	If for unavoidable reasons the first spray cannot be applied, use the arsenate of lead in this application with the self-boiled lime-sulphur.
(5) Four weeks before each variety is due to ripen.	Arsenate of lead 2 lb., 8-8-50 self-boiled lime-sulphur 100 gal.	Curculio, brown rot, scab.	This is a very important spray for the second brood of curculio "worms," and must be applied according to the ripening period of each variety. It is, furthermore, the most important application for brown rot control.

DUSTING PROGRAM FOR PEACHES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lubricating oil emulsion 3% (see General Remarks); or lime-sulphur 11 gal., water to make 100 gal. When oil emulsion is used, add 4-4-50 Bordeaux for peach leaf curl in sections where prevalent.	San Jose and other scale insects, leaf curl.	Lime-sulphur solution should not be used on peach trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals (pink part of flower) have fallen.	Arsenate of lead 5%, lime 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(3) When calyces or "shucks" are shedding or when small peaches are exposed. This is usually about 10 days after the falling of the petals.	Arsenate of lead 5%, lime 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(4) Two weeks after the third application or about 4 weeks after the petals have been shed.	Sulphur 80%, arsenate of lead 5%, lime 15%.	Scab, brown rot.	
(5) Four weeks before each variety is due to ripen.	Sulphur 80%, arsenate of lead 5%, lime 15%.	Curculio, brown rot, scab.	

SPRAYING PROGRAM FOR PLUMS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lubricating oil emulsion 3% (see General Remarks); or lime-sulphur 11 gal., water to make 100 gal.	San Jose and other scale insects.	Lime-sulphur solution should not be used on plum trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals have fallen.	Arsenate of lead 2 lb., lime water from 6 lb. unslaked lime, water to make 100 gal.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 8 lb. to 100 gal. water.
(3) When calyces or "shucks" are shedding or when small plums are exposed.	Arsenate of lead 2 lb., lime water from 6 lb. unslaked lime, water to make 100 gal.	Curculio.	If hydrated lime is used instead of the unslaked lime, use 8 lb. to 100 gal. water.
(4) Two weeks after the third application.	8-8-50 self-boiled lime-sulphur 100 gal., calcium caseinate 1 lb.	Brown rot, leaf spot.	For all varieties of plums other than the Japanese, lime-sulphur concentrate, 3 parts to 100 parts water, should be used instead of self-boiled lime-sulphur.
(5) Four weeks before ripening.	8-8-50 self-boiled lime-sulphur 100 gal., arsenate of lead 2 lb., calcium caseinate 1 lb.	Curculio, brown rot, leaf spot.	For all varieties of plums other than the Japanese, lime-sulphur concentrate, 3 parts to 100 parts water, should be used instead of the self-boiled lime-sulphur.

DUSTING PROGRAM FOR PLUMS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During winter.	Lubricating oil emulsion 3% (see General Remarks); or lime-sulphur 11 gal., water to make 100 gal.	San Jose and other scale insects.	Lime-sulphur solution should not be used on plum trees in the South until after two or three good killing frosts have occurred. The lubricating oil emulsion can be used any time after the leaves fall.
(2) When 75% of the petals have fallen.	Arsenate of lead 5%, lime 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(3) When calyces or "shucks" are shedding or when small plums are exposed.	Arsenate of lead 5%, lime 95%.	Curculio.	It is not necessary to use sulphur in this application, although the 80-5-15 dust formula may be used if desired.
(4) Two weeks after third application.	Sulphur 80%, arsenate of lead 5%, lime 15%.	Scab, brown rot.	
(5) Four weeks before ripening.	Sulphur 80%, arsenate of lead 5%, lime 15%.	Curculio, brown rot, scab.	

GENERAL REMARKS

Lubricating Oil Emulsion—The stock lubricating oil emulsion usually contains 60@% of oil. Add 4½ gal. of this stock emulsion to 95½ gal. water to make a 3% emulsion.

Arsenate of Lead—The recommendations for arsenate of lead are based on the powdered form; if the paste form is used, double the amount.

Program for Southeast

United States Department of Agriculture

SPRAYING PROGRAM FOR SOUR CHERRIES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lubricating oil emulsion 3%; or lime-sulphur 11 gal., water to make 100 gal.	San Jose and other scale insects.	
(2) When 75% of the petals have fallen.	Arsenate of lead 2 lb., lime water from 6 lb. unslaked lime, lime-sulphur 3 gal., water to make 100 gal.	Curculio, leaf spot.	
(3) Three weeks after the shedding of the petals.	Arsenate of lead 2 lb., lime water from 6 lb. unslaked lime, lime-sulphur 3 gal., water to make 100 gal.	Curculio, brown-rot, leaf spot.	
(4) Immediately after fruit is harvested.	Lime-sulphur 3 gal., water to make 100 gal.	Leaf spot.	

SWEET CHERRIES

Sweet cherries should receive the same materials as noted for the sour varieties, except that for the summer sprays the lime-sulphur concentrate should be used in the proportion of 2 gal. to 100 gal. of water.

SPRAYING PROGRAM FOR APPLES, PEARS AND QUINCES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During winter when trees are dormant.	Lubricating oil emulsion 3% (see General Remarks); or lime-sulphur 11 gal., water to make 100 gal.	San Jose and other scale insects.	In localities where aphids are troublesome this application should be delayed until the green can just be seen in the end of the blossom buds; if aphids are prevalent add ½ pint 40% nicotine sulphate to 50 gal. water.
(2) Immediately after cluster buds have opened.	Arsenate of lead 2 lb., lime-sulphur 3 gal., water to make 100 gal.	Curculio, tent caterpillar, scab, etc.	Add nicotine sulphate if aphids are troublesome. This spray may be omitted on varieties not susceptible to scab.
(3) Immediately after the petals fall.	Arsenate of lead 2 lb., lime-sulphur 3 gal., water to make 100 gal.	Codling moth, curculio, leaf roller, tent caterpillar, scab, etc.	This is the most important application for the codling moth, and the spray should be driven well into the calyx end of the small apples. Avoid over-spraying.
(4) Two to 3 weeks after petals fall.	Arsenate of lead 2 lb., 3-4-50 Bordeaux 100 gal.	Codling moth, leaf roller, scab, leaf spot, blotch, etc.	
(5) Three weeks after fourth application.	Arsenate of lead 2 lb., 3-4-50 Bordeaux 100 gal.	Codling moth, blotch, bitter and black rots.	
(6) Two to 3 weeks after fifth application.	Arsenate of lead 2 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, bitter and black rots, blotch.	
(7) One month before each variety is due to ripen.	Arsenate of lead 2 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, bitter rot.	If bitter rot is severe, apply Bordeaux between sixth and seventh applications at 2 to 3-week intervals.

Note—Summer apples usually need only the first, second, third and fourth applications of the above spray program; however, the latest ripening summer varieties may need the fifth and sixth.

Pears and quinces usually require only applications 1, 3, 4 and 6, and Bordeaux mixture may be used in place of the lime-sulphur on these fruits.

SPRAYING PROGRAM FOR GRAPES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During winter when vines are dormant.	Lubricating oil emulsion 3% (see General Remarks); or lime-sulphur 11 gal., water to make 100 gal.	Scale insects.	
(2) Just before blossoms open.	Arsenate of lead 3 lb., 4-3-50 Bordeaux 100 gal.	Flea beetles, rose chafers, anthracnose, black rot, mildew.	
(3) After blossoms fall.	Arsenate of lead 3 lb., 4-3-50 Bordeaux 100 gal.	Flea beetles, rose chafers, grape leaf folders, anthracnose, black rot, mildew.	
(4) Two weeks later.	Arsenate of lead 3 lb., nicotine sulphate ½ pint, calcium caseinate 1 lb., 4-3-50 Bordeaux 100 gal.	Leaf hoppers, aphids, leaf folders, fungous diseases.	
(5) Two weeks before fruit is due to ripen.	Neutral copper sulphate or basic acetate of copper 2 lb., calcium caseinate 1 lb., water 100 gal.	Black rot, mildew.	

SPRAYING PROGRAM FOR BLACKBERRIES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) During late winter just before growth starts.	Lime-sulphur 11 gal., water to make 100 gal.	Scale insects, anthracnose.	
(2) When new shoots are 6 ins. high.	Lime-sulphur 2½ gal., water to make 100 gal.	Anthracnose.	Add arsenate of lead 2 lb. to 100 gal. water if chewing insects are troublesome.
(3) When new shoots are 10 ins. high.	Lime-sulphur 2½ gal., water to make 100 gal.	Anthracnose.	Add arsenate of lead 2 lb. to 100 gal. of water if chewing insects are troublesome.
(4) Just before blooms open.	Lime-sulphur 2½ gal., water to make 100 gal.	Anthracnose.	Add arsenate of lead 2 lb. to 100 gal. water if chewing insects are troublesome.

SPRAYING PROGRAM FOR STRAWBERRIES

Time of Application.	Materials to Use.	For Control of	Remarks.
(1) Just before blossoms open.	4-4-50 Bordeaux.	Leaf spot.	
(2) After blossoms open.	4-4-50 Bordeaux.	Leaf spot.	Add 2 lb. arsenate of lead to 100 gal. of spray if leaf rollers or flea beetles are present.
(3) Two weeks later.	4-4-50 Bordeaux.	Leaf spot.	Add 2 lb. arsenate of lead to 100 gal. of spray if leaf rollers or flea beetles are present.

REMARKS.

Lime-Sulphur—The recommendations for lime-sulphur are based on the use of concentrate testing 32 degrees Baume.

Recommendations for disease control in above schedules furnished by the Office of Fruit Disease Investigations, Bureau of Plant Industry, United States Department of Agriculture.

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Mean More Profits Per Tree

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MYERS Self-Oiling Power Spray Pumps and complete Power Spray Rigs furnish you the maximum spraying efficiency at the lowest possible cost.

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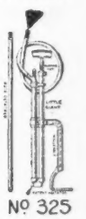
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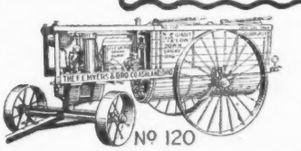
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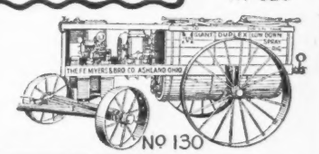
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The cut under style "Friend" Sprayer has more useful features than any other sprayer built. The objectionable features of cheaper sprayers are not found on this outfit.

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Front view

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And because it can be worked close to the trees it quickly levels and pulverizes the ridges that have been built up through years of plowing. The picture shows the disks pulling the soil away from the trees but the gangs can be reversed to throw it toward the trees.

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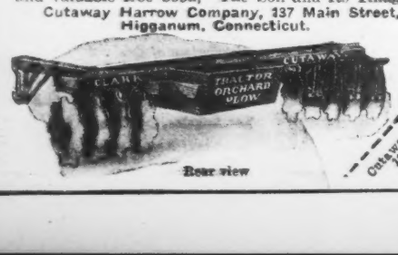

Rear view

MAIL COUPON

Cutaway Harrow Company, 137 Main Street, Higganum, Conn.

Send me literature mentioned above, also your FREE book "The Soil and Its Tillage."

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Spraying Calendar for

By Laval S. Morris,

The Rocky Mountain district is a large one and includes a diversity of conditions. Therefore, it is natural that fruit pests in one locality should present problems different from those of other localities. The codling moth is perhaps the worst enemy of apples in the leading growing sections of this district, but there are a number of localities in which it is unnecessary to spray for this pest. This, of course, may not always be true. In many places, it is unnecessary to apply a dormant spray more often than once in every four or five years; in other sections it would be ruinous not to spray every year.

Certain of the insect and disease pests listed in the spray calendar are troublesome year after

APPLES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Codling moth.	Arsenate of lead 3 lb., water 100 gal.	(1) Immediately after petals fall. (2) Ten days to 2 weeks later. (3) One month later. (4) Spray later if necessary.	Keep in touch with crop pest inspector as to time of hatching.
Scale insects.	Lime-sulphur 12 gal., water to make 100 gal.; or miscible oil according to manufacturers' directions.	In spring before buds open and in autumn after leaves fall.	If insects are bad in summer, they may be partly checked by light kerosene emulsion.
Fruit tree leaf roller.	Miscible oil for eggs. Arsenate of lead 6 lbs., water 100 gal., for larvae.	Miscible oil in early spring. Lead arsenate when buds are opening.	Codling moth spray helps. Do not spray when trees are in blossom, as honeybees are injured.
Green apple aphis.	Prune infected shoots. Spray with tobacco extract 2 pints, water 100 gal.	When insects appear and before leaves curl. Prune after leaves curl.	Kerosene emulsion and soap solution are recommended also.
Apple curculio.	Destroy hibernating places. Cultivate soil. Spray with arsenate of lead 3 lb., water 100 gal.	Spray after petals fall.	The spray for codling moth will control this insect. In some cases it will be well to destroy wild hawthornes.
Apple leaf hopper.	Nicotine sulphate 1 pint, water 100 gal. Dip nursery stock in soap solution.	Early in season before wing stage appears.	The insects stay under surface of leaves, therefore spray the under surface.
Bud moth.	Arsenate of lead 3 lb., water 100 gal.	When buds are bursting.	This insect has been reported in the northern end of the district only, but is spreading.
Leaf blister mite.	Lime-sulphur 9 gal., water to make 100 gal.; or miscible oil 6½ gal., water to make 100 gal.	Dormant season until buds open.	This insect lives under a blister on the leaves and cannot be treated in the summer.
Apple-tree borers. 1. Round headed. 2. Flat headed.	Keep trees vigorous. Dig larvae out before they enter the heart wood. Prevent egg laying on trunks by painting with pure white lead and linseed oil.	Paint before June 1.	Carbon disulphide may be effective by injecting into hole and plugging up.
Fire blight.	See under pears.		
Blue mold.	Avoid bruising and wounding apples. Do not pile apples in storage. (Keep storage temperature low, 30° to 32°.)	When picking and storing.	Blue mold is a storage disease and does much damage under improper conditions.
Apple scab.	Lime-sulphur 2½ gal., water to make 100 gal.; or copper sulphate 9 lb., water 100 gal.	Just before buds open.	This disease is not very troublesome in the dry climate of the Rocky Mountain region.

PEARS

What to Spray For.	Treatment.	When to Treat.	Remarks.
Pear or cherry slug.	Arsenate of lead 3 lbs., water 100 gal.; or nicotine sulphate 1 pint, water 100 gal.	When insects appear.	This insect can be controlled by contact spray as well as stomach poison.
Leaf blister mite.	Same as for apples.		
Codling moth.	Same as for apples.		
San Jose scale.	Same as for apples.		
Fire blight (pear blight).	Prune out infected branches, making cut well below darkened area. Sterilize tools and wounds with mercuric cyanide. Avoid too rapid growth of trees.	In winter and in summer when infected branches are observed.	This disease has exterminated many Bartlett pear orchards in this region. Planting resistant varieties is recommended.

PEACHES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Peach tree borer.	Apply 1 oz. P. D. B. at base of tree. For trees under 6 years, use less.	Early September.	Digging out larvae is not practical.
Peach twig borer.	Lime-sulphur 10 gal., arsenate of lead 3 lb., water to make 100 gal.	Use lime-sulphur in spring before buds burst. Arsenate of lead as buds are bursting and as fruit is maturing if insects are numerous.	Trees kept in a vigorous condition are not bothered much.
Green peach aphis.	Tobacco solution 2 pints, water 100 gal.	As soon as insects appear in spring or early summer.	This insect spreads to other crops, hence spray before migration.
Black peach aphis.	Dip nursery stock in strong tobacco solution. Spray leaves with tobacco solution. Apply tobacco solution or tobacco dust at base of tree and on exposed roots.	To nursery stock when planted. Spray leaves when aphis appear. Treat roots in early summer.	This insect does most damage to the roots. Some aphids, however, attack the leaves during the early growing season. Tobacco dust is effective on moist soil but not on the leaves.
California peach blight.	Prune cankers out. Spray with lime-sulphur 12 gal., water to make 100 gal., in dormant season. In growing season, use 6-6-50 Bordeaux; or lime-sulphur 2 gal., water to make 100 gal.	Prune in spring and as cankers appear. Spray as soon as crop is harvested and early in spring.	This disease is prevalent in a few places only.
Peach leaf curl.	Lime-sulphur 12 gal., water to make 100 gal.	Before buds open in spring.	It is very seldom necessary to spray for this disease.

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 32 degrees Baume.

Rocky Mountain Area

Brigham Young University

year only in certain sections. This means, then, that each grower should become familiar with the pests which are especially bad in his section and spray accordingly. This leads to the conclusion that a definite yearly spray program for the Rocky Mountain district is not as practical as a consideration of the individual pests. However, it is recommended that wherever pests are virulent and persistent enough to warrant the application of a certain number of sprays yearly, such a program be carried out.

Fruit growers should be on the alert and study their individual problems, because the degree of attack of pests may vary greatly from year to year.

CHERRIES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Cherry or pear slug.	See under pear.		This insect is extremely injurious and should receive special attention at present.
Black cherry aphis.	See under pear.		
Shot hole disease (leaf blight).	Lime-sulphur 2 gal., water to make 100 gal.	After the fruit has set.	This disease is not serious in the Rocky Mountain district.

PLUMS

What to Spray For.	Treatment.	When to Treat.	Remarks.
Pear or cherry slug.	See under pear.		Plums are practically free from pests in this district.

APRICOTS

What to Spray For.	Treatment.	When to Treat.	Remarks.
Peach twig borer.	See under peach.		

STRAWBERRIES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Strawberry leaf roller.	Arsenate of lead 3 lb., water 100 gal.	When adult moths appear in spring.	If pest is very troublesome, cut vines and burn after harvest.
Strawberry crown girdler.	Rotation of crops. Plow up patch when badly infected.	After crop is harvested.	If insects are not numerous, the patch may be left 3 or 4 years.
Strawberry root aphis.	Scatter straw over plants in early spring and burn. Plow up old infected patches.	After eggs hatch and aphis appear in spring.	Proper rotation of crops will keep this insect fairly well in check.
White grubs.	Proper crop rotation.	When necessary.	If grubs are bad, strawberries should not follow sod.
Chlorosis (yellow leaves).	Plant in soil that does not cause leaves to turn yellow.		The cause of chlorosis is not definitely known.

GRAPES

What to Spray For.	Treatment.	When to Treat.	Remarks.
Grapevine leaf hopper.	Nicotine sulphate 3 pints, soap 2 lb., water 100 gal.	Early spring.	Sanitation in cultural methods is very important.
Powdery mildew.	See under insects that feed promiscuously.		
Downy mildew.	Spray with 5-5-50 Bordeaux; or dust with sulphur.	Just before the blossom buds open.	This disease is very seldom virulent in this district.
Crown gall.	Prune out infected branches. Plant resistant varieties. If vines are badly infected, remove and burn them.	Prune during dormant season.	This disease attacks chiefly the European varieties.
Dead arm.	Prune out infected branches. If badly infected, remove vines. Take cuttings from disease-free vineyards.	During growing seasons when effects of disease can be observed.	In pruning, the cuts should be made some distance below infected area. If disease becomes bad, spread may be checked with Bordeaux.
Phylloxera.	Graft European varieties on resistant American stocks.		In many cases, the phylloxera is not bad enough to bother with.

INSECTS THAT FEED PROMISCUOUSLY

What to Spray For.	Treatment.	When to Treat.	Remarks.
Buffalo tree hopper.	Clean cultivation. Burn pruned wood.	Cultivate in early spring so as to keep all weeds down. Prune and burn wood in early spring.	This insect does damage to fruit trees by making punctures in which to lay eggs.
Woolly aphis (plant lice).	Nicotine sulphate 1 pint, water 100 gal.; or 15% kerosene emulsion (see General Remarks).	When aphis appear in spring and before leaves curl.	In some cases, it may be well to prune out infected shoots after leaves curl.
Grasshoppers and crickets.	Tear up breeding grounds with disk or spring-tooth harrow. Scatter arsenic-bran mash in infested fields.	When they become numerous.	Traps may be used to good advantage some years.
Clover mite.	Lime-sulphur 12 gal., water to make 100 gal.; or miscible oil according to manufacturers' directions.	During dormant season.	San Jose scale treatment destroys the eggs of this mite. The mite feeds on clover and various fruit trees.
Red spider.	Tobacco solution 2 pints, clear cold water 100 gal.	When spiders first appear.	It is effective to use 2 lb. of soap per 100 gal. of spray. Cold water is sometimes effective; however, tobacco solution is more certain.
Tent caterpillar.	Prune out and burn tent masses. Spray with arsenate of lead 3 lb., water 100 gal.	In early growing season when caterpillars appear.	These insects are fairly well controlled by natural enemies.
San Jose and Putnam's scales.	Lime-sulphur 12 gal., water to make 100 gal.; or miscible oil according to manufacturers directions.		
Powdery mildew.	Dust with sulphur; or spray with Bordeaux.	In summer as disease appears.	This is the only important disease that attacks various plants. It has become especially bad on grapes lately.

Kerosene Emulsion—Kerosene emulsion is prepared by shaving ½ lb. laundry soap in 1 gal. boiling soft water. When the soap is dissolved, remove the solution from the fire and add 2 gal. kerosene. Agitate violently until the kerosene and soap solution are thoroughly emulsified. This is the stock solution, and it will keep indefinitely if sealed from air. To make a 15% kerosene emulsion, add 1 gal. of the stock solution to 3½ gal. water.

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A real giant for work. Capacity up to 23 gallons a minute at 300-400 pounds pressure. For large acreages and where very rapid high pressure work is required.

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Mixes its own dust, thus cutting the cost of material in half. Simple, efficient, economical. For truck crops and orchard work.

BEAN Super-Giant throwing spray to top of tall walnut trees. Pressure!

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For big crops of clean fancy fruit—the kind that always enjoys the best markets and brings the top price—keep your trees free from the insects that sap their vitality, cut down production, and destroy the quality and fine appearance of the fruit.

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The BEAN is the sprayer with Patented Pressure Regulator (no danger at any pressure), Troubleless Ball Valves with noncorroding *threadless covers* and removable and reversible seats (any valve can be removed in a jiffy without stopping the engine or losing the pressure), BEAN long-life Over-size Pump without stuffing boxes or stuffing box troubles, Underslung Steel Rear Axle with tank load over high wheels for easy hauling, BEAN Permanently Porcelained Cylinders which are practically indestructible, and many other features patented and protected so that they can be found on no other spray outfit in their present efficient design.

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Please send me your 1927 catalog and book of *Better Spraying.*

Acres.....Kind of Fruit.....

Name.....

Address.....

Spray Calendar for Southern California

By E. O. Essig, University of California

TEMPERATE ZONE FRUITS

APPLES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Before the buds begin to open.	Lime-sulphur 10 gal., water to make 100 gal.; or any of the oil sprays (see General Remarks).	San Jose scale, oyster shell scale.	Use coarse, driving spray.
	Miscible oil or crude oil sprays (see General Remarks).	Fruit tree leaf roller, San Jose scale, oyster shell scale.	Use coarse, driving spray.
(2) Cluster-bud spray. When buds begin to separate, but before they open.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.; or arsenate of lead 2 lb., 4-4-50 Bordeaux 100 gal.	Apple scab, mildew, fruit tree leaf roller, aphis.	Add ½ pint nicotine sulphate when aphids are present.
(3) First codling moth spray. When most of the petals have fallen.	Lime-sulphur 3 gal., arsenate of lead 2 lb., water to make 100 gal.; or arsenate of lead 2 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, scab, aphis, mildew.	For mildew add 8 lb. sulphur to each 100 gal. For aphis add ½ pint nicotine sulphate. For codling moth repeat in 3 weeks and again in 8 to 10 weeks.

PEARS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Before the buds begin to open.	Lime-sulphur 10 gal., water to make 100 gal.; or oil sprays (see General Remarks).	San Jose scale, oyster shell scale, Italian pear scale.	Apply spray thoroughly to all parts of the trees.
	Miscible or carbolic oil sprays (see General Remarks).	Mealy bugs.	Scrape bark and make one or more applications of spray.
(2) Cluster-bud spray. When buds begin to separate but before they open.	Lime-sulphur 2½ gal., arsenate of lead 2 lb., water to make 100 gal.; or arsenate of lead 2 lb., 4-4-50 Bordeaux 100 gal.	Codling moth, blister mite, cankerworms, scab.	For codling moth repeat in two or three weeks.
	Spray with (1) miscible oil 3 gal., nicotine sulphate 1 pint, water to make 100 gal., or (2) highly refined lubricating oil emulsion 4 gal., water to make 100 gal.; or dust with nicodust.	Pear thrips.	Repeat applications as necessary.

APRICOTS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant. Before the buds begin to open.	Lime-sulphur 10 gal., water to make 100 gal.; or 4-4-50 Bordeaux.	Peach blight or shot hole fungus, brown rot.	Spray new growth thoroughly.
	Oil sprays (see General Remarks).	Brown apricot scale.	Spray new growth thoroughly.
(2) When buds are bursting and first few blossoms appear.	Lime-sulphur 10 gal., arsenate of lead 3 lb., water to make 100 gal.; or arsenate of lead 3 lb., 4-4-50 Bordeaux 100 gal.	Peach twig borer, shot hole fungus or peach blight, leaf curl.	Use basic arsenate of lead in fog belt.

PEACHES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Before buds begin to swell.	Lime-sulphur 10 gal., water to make 100 gal.; or 4-4-50 Bordeaux.	Peach blight or shot hole fungus, peach leaf curl.	These sprays are preferably made in November.
	Lime-sulphur 10 gal., water to make 100 gal.; or oil sprays (see General Remarks).	San Jose scale.	Thoroughly cover entire tree.
(2) When buds begin to swell and the first few flowers open.	Lime-sulphur 10 gal., arsenate of lead 3 lb., water to make 100 gal.; or arsenate of lead 3 lb., 4-4-50 Bordeaux 100 gal.	Peach blight or shot hole fungus, peach leaf curl, San Jose scale, peach twig borer.	Use Bordeaux in sections where injury is caused by lime-sulphur.
(3) Summer sprays.	Spray with (1) lime-sulphur 2½ gal., water to make 100 gal.; or (2) wettable sulphur (see General Remarks); or (3) highly refined lubricating oil emulsion (see General Remarks); or dust with dry sulphur.	Red spider.	Apply whenever the spider appears and repeat if necessary. Keep soil well supplied with moisture.

PLUMS AND PRUNES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Before buds begin to swell.	Lime-sulphur 10 gal., water to make 100 gal.	Peach blight or shot hole fungus, San Jose scale.	
	Oil sprays (see General Remarks).	San Jose scale, Italian pear scale.	Add 4 lb. caustic soda to remove moss or lichens.
(2) Cluster-bud spray. When buds begin to separate but before they open.	Spray with (1) miscible oil 3 gal., nicotine sulphate 1 pint, water to make 100 gal.; or (2) highly refined lubricating oil emulsion 2 gal., water 100 gal.; or dust with nicodust.	Pear thrips.	It may be necessary to make added applications when the blossoms open and the fruit is in the jackets.
(3) Summer sprays. When trees are in foliage.	Spray with (1) lubricating oil emulsion 1 gal., water to make 100 gal.; or (2) wettable sulphur (see General Remarks); or (3) lime-sulphur 2½ gal., water to make 100 gal.; or dust with dry sulphur.	Red spider.	Apply when mites appear.
	Highly refined lubricating oil emulsion 2 gal., water to make 100 gal.; or whale oil soap 5 lb., water 100 gal.	Mealy plum louse.	Care must be taken to thoroughly drench the undersides of the leaves.

BERRIES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Cluster-bud spray. When blossom buds are formed and before they open.	Lime-sulphur 2½ gal., water to make 100 gal.; or wettable sulphur (see General Remarks).	Mite causing redberry disease of Himalaya blackberry.	If this application is not made, use wettable sulphur at any time during early summer before berries are half grown.
(2) Summer sprays.	Highly refined lubricating oil emulsion (see General Remarks).	Strawberry aphis, red spider on various berries.	Apply to both surfaces of leaves.

SUBTROPICAL FRUITS AND NUTS

CITRUS FRUITS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Fall, winter and spring.	Fumigate with HCN gas; or spray with highly refined oil emulsion (see General Remarks).	Scale insects.	Spraying must be done thoroughly. Follow recommendations as to dilution and times to apply.
	4-4-50 Bordeaux.	Brown rot.	
(2) Spring, summer and fall.	Spray with (1) lime-sulphur 2 gal., water to make 100 gal.; or (2) wettable sulphur (see General Remarks); or (3) highly refined lubricating oil emulsion (see General Remarks); or dust with dry sulphur.	Red spiders.	Apply as soon as mites appear and as often as necessary.
	Lime-sulphur 2 gal., nicotine sulphate ¾ pint, water to make 100 gal.; or highly refined lubricating oil emulsion (see General Remarks).	Citrus thrips.	Two or more applications may be necessary.

WALNUTS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) May, June or July.	Spray with basic arsenate of lead 3 lb., water 100 gal.; or dust with arsenate of lead 15%, hydrated lime 85%.	Codling moth.	Begin applications as soon as the work on the green husks appear.
	2% nicodust.	Walnut aphis.	When aphis appear.

FIGS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant. Before buds begin to swell.	Lime-sulphur 10 gal., water to make 100 gal.; or oil sprays (see General Remarks).	Fig scale.	

ALMONDS

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Dormant spray. Before buds begin to swell.	Lime-sulphur 10 gal., water to make 100 gal.	Red spider eggs, peach blight or shot hole fungus, brown rot, San Jose scale.	
(2) When buds are swelling and first few flowers are opening.	Lime-sulphur 10 gal., water to make 100 gal.	Red spider, peach blight, brown rot, San Jose scale, peach twig borer.	Make thorough applications.
(3) Summer spray. When trees are in foliage.	Spray with (1) highly refined lubricating oil emulsion (see General Remarks); or (2) wettable sulphur (see General Remarks); or (3) lime-sulphur 3 gal., water to make 100 gal.; or dust with sulphur.	Red spider.	When the mites appear in early spring and summer.

GRAPES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Early spring. When new shoots are 6 to 8 in. long and again when fruit is the size of buckshot.	Dust with dry sulphur.	Mildew.	Make one or two applications.
(2) Spring and summer.	Spray with nicotine sulphate ½ pint, hard soap 1 lb., water 100 gal.; or dust with 50% calcium cyanide.	Grape leaf hopper.	Apply when nymphs or young first appear.

OLIVES

Time of Application.	Materials to Use.	For Control of.	Remarks.
(1) Winter. During December, January or February.	Oil sprays (see General Remarks).	Ivy scale, black scale.	

GENERAL REMARKS

Arsenate of Lead—The directions in these schedules are based upon powdered arsenate of lead; if the paste form is used, double the amount. If combined with lime-sulphur or Bordeaux mixture, the neutral or basic form is to be preferred. The neutral or basic form should also be used in the fog belt along the coast.

Lime-Sulphur—The directions in these schedules are based upon the use of lime-sulphur concentrate testing 33 degrees Baume. Applications of this material in hot, dry weather should be avoided.

Wettable Sulphur—This material is made of hydrated lime, superfine sulphur and calcium caseinate. Use these materials in the proportions of 8 lb. hydrated lime, 16 lb. superfine sulphur and 1 lb. calcium caseinate. The materials can be mixed dry in advance and stored for use. In preparing the dilute spray, fill the spray tank half full of water, then with agitator running, add the dry material slowly, directing the spray nozzle upon the material until it has disappeared in the water. In the above formulas, 5 lb. of the dry mixture are used for 100 gal. of dilute material.

Oil Sprays—There is a great variety of oil sprays on the market. Growers are advised to consult with their local horticultural commissioner or county agent before buying and using the same, or to follow the manufacturers' directions in regard to dilution.

Nicotine Sulphate—The directions in these schedules are based upon the use of 40% nicotine sulphate.

Dusts—Nicodusts and calcium cyanide dusts are available in various strengths. The former are also available in combination with lime, arsenate of lead, etc.

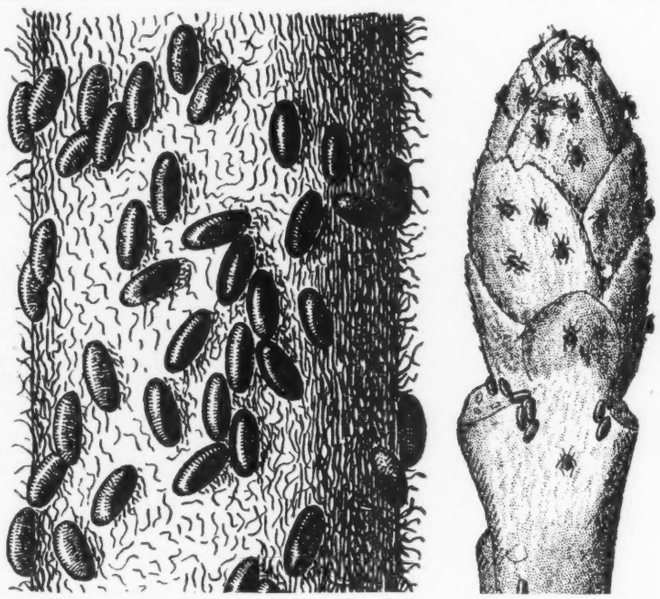
A Perspective of the Oil Spray Situation

(*Continued from page* 3)

which the red spider has become increasingly destructive in spite of foliage applications of lime-sulphur and when the trees display a heavy deposition of eggs. In case of plantings where foliage applications of lime-sulphur are not intended or not considered desirable, such a situation points clearly to the wisdom of applying either a lubricating oil emulsion containing not less than three per cent of oil or a miscible oil to destroy the eggs; or one or more foliage treatments with one of the highly refined "white" oil emulsions to dispose of the active mites. There is little doubt of the efficiency of lubricating oil emulsions or of the leading brands of miscible oils in destroying the eggs of this pest.

In view of the desirability of applying at this period a combined fungicide and insecticide which will control scab, scale and caterpillars of various kinds, as well as aphids, there is, according to our experience, no more satisfactory mixture than lime-sulphur to which is added nicotine sulphate and lead arsenate. Realizing that there are growers to whom this mixture is anathema, largely because of the cost of materials, one would like to suggest a satisfactory alternative. This is difficult to do, but probably the best suggestion is the Bordeaux-oil spray. It is a promising material, but since it is a comparatively new spray, there is, unfortunately, some doubt relative to its safeness on foliage, as well as to its killing efficiency as far as the rosy aphids and other species are concerned. Drenching of the opening apple buds with the spray reduces materially the number of the aphids. If future experiments demonstrate that it is a safe material for a delayed dormant application (to date it appears that it is), any deficiency in its aphiscidal properties can probably be remedied by increasing the oil content or by adding a small

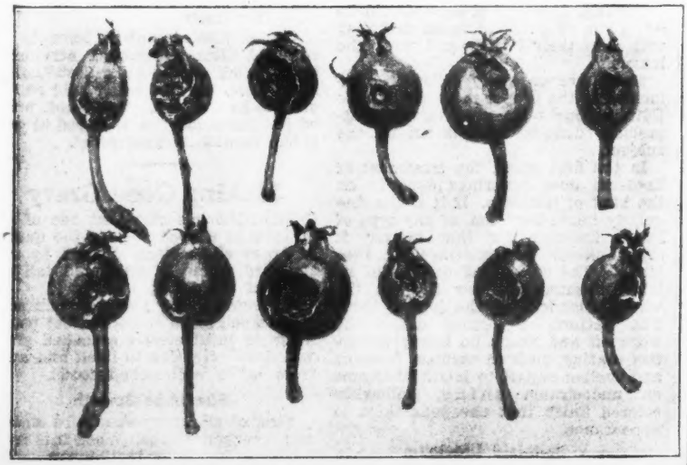
(*Concluded on page* 45)



Apple aphis eggs (left) and newly hatched nymphs (right). The eggs are less susceptible to oil sprays than the newly hatched nymphs. Oil emulsion and nicotine sulphate, applied as a delayed dormant spray when the young aphids are hatching from the tips of the opening buds, are a promising means of control

Delayed Dormant Treatment for Rosy Aphis

We have been unable to secure any evidence indicating that oil sprays at usual strengths have any appreciable influence on the eggs of the apple aphids. Tests with many types of oils and with the leading brands of commercial miscible oils at recommended dilutions point to the conclusion that these materials, applied when the buds are swelling or when they barely show green tissue (at which period most of the insects are in the egg stage), do not afford material protection during seasons favorable for destructive outbreaks. According to



Destructive work of leaf roller caterpillars on young apples

HAYES
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Here's some more evidence that Hayes Sprayers do even more efficient work than is claimed for them. Read Mr. Colson's letter.

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Galva, Illinois

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(signed) E. G. Colson, Mgr.
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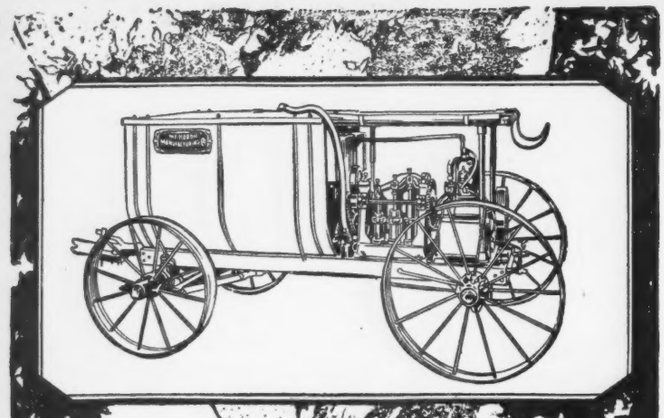

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CHATS WITH FRUIT GROWER'S WIFE

By HAZEL BURSELL

Do Plain Sewing Now

ARE YOU a good manager? Do you plan your work so that you can get it done efficiently and in good season, thus avoiding the last minute rush?

If you are a good planner and an efficient workman, you may not need the suggestions outlined in this article. If not, these ideas may appeal to you and, if carried out, may lead to most gratifying results. These suggestions deal with your spring and summer sewing.

"But," you protest, "it is altogether too early to begin summer sewing. Spring fashions aren't even out yet!"

"Yes, of course, but what about clothes for the children, both outer and under garments?" we come right back with. "What about those new curtains for the kitchen and for yours and daughter's bedrooms? What about the comforters, sheets, pillowcases and other household linens that need replenishing? What about your own underwear? We can't say we're waiting for the fashion sheets before making them."

Most Styles Unchanged

So our alibi does not hold very well, and we see that there is no real valid reason for leaving all the "straight sewing" for the busy spring and summer months. Styles haven't changed radically in young children's clothes, women's underwear and household linens for a number of years, and no such changes are in immediate prospect. Therefore, we can prepare all these things, press them and put them away till needed, then draw a deep breath of satisfaction and proceed with other things with a light heart. When the fashion plates do actually appear, we will be free to give our whole attention to our summer wardrobe.

Think how glorious you will feel this spring when the sun shines, and the earth seems fairly to call you out-of-doors, and you can answer the call joyously and with mind untroubled with thoughts of that "sewing I ought to be doing." You can garden, picnic, or plan a long motor trip with nothing but the daily routine to hinder you.

The woman who is forehanded is thrice blessed—blessed by her family, blessed by her neighbors, and blessed within herself. These blessings are of the kind that can be cultivated.

Caring for Linoleums

DO YOU know what care should be given your linoleums so that they will keep their beauty and wear the longest?

There are so many different opinions as to the proper methods that Ye Editor thought her readers would appreciate definite information on the subject.

In the first place, the treatment of linoleum floor coverings depends on the kind of linoleum. If it is the fine quality inlaid linoleum, or any type of inlaid linoleum for that matter, it should *never be varnished or shellacked.* The colors and designs of inlaid linoleum go clear through the whole thickness to the burlap back. The pattern, therefore, cannot be worn off and needs no heavy protective coating, such as varnish. Varnish and shellac impart to inlaid linoleums an undesirable shiny, yellowish-colored finish that cheapens them in appearance.

Wax Inlaid Linoleum

Inlaid linoleum does, however, require an occasional waxing, say once or twice a year, to keep the surface lustrous and bright and to simplify cleaning. The wax should be applied sparingly and should be rubbed in well. Paste wax may be applied with a cloth or with any one of the inexpensive weighted waxing brushes, which may be purchased at hardware or furniture stores. To insure even distribution of the wax and prevent discolored spots from excessive wax, place a small quantity of wax between folds of cheesecloth. Then rub the cheesecloth pad over the linoleum with a weighted brush or heavy flat stone, wrapped in a soft cloth.

Liquid wax, used on a small piece of cheesecloth, is ideal for occasionally touching up the walked-on places, such as passageways, doorways and closet entrances.

Varnish Printed Linoleums

Should your floor covering be printed linoleum, the treatment, though just as simple as for inlaid carpet, is quite different. Printed linoleum is made of the same materials as the other—cork, oxidized linseed oil and burlap—but the designs are printed on the surface in heavy oil paints. These designs will naturally wear off in time if left unprotected.

Therefore, we should varnish or shellac printed linoleums. Varnishing, according to various authorities, is better than shellacking, and cheaper, too, when wear is considered. Select a good waterproof varnish, clear and colorless. Cheap varnishes are often cloudy and will mar the colors of the linoleum design. Then, too, they are apt to turn white when water is spilled on them. Be sure that the varnish is thin enough to flow evenly from your brush. Good varnish is quick-drying and you will get into difficulties if your varnish is not thinned out. Apply in two thin coats, allowing at least a day between coats. Be sure the last coat is thoroughly dry before the floor is walked on. The varnish will need to be renewed once or twice a year, according to the wear on the floor.

Before waxing plain or inlaid linoleum or varnishing printed linoleum, make sure that the surface is thoroughly clean. Avoid strong alkali soaps and harsh washing powders in cleaning, as they are likely to injure the linoleum, either by scratching the surface or eating into the body of the carpet. It is wise to wash and rinse but a small section of linoleum at a time to prevent streaking. Use clean water for rinsing.

Waxed linoleums will have to be rewaxed after a thorough scrubbing, but a quick wiping up will suffice for some time, the dirt being held on the surface by the wax. Varnished, printed linoleums may be scrubbed at will, if the varnish is waterproof.

Making Good Gravy

SOMEONE has said that one of the tests of a good cook is the quality of gravy she serves. Judged by that standard, some of us would fall far short of perfection.

Good gravy may make a plain meal seem much more elaborate, but poorly made or insufficiently seasoned gravy will draw attention to itself and away from other well-cooked foods.

Should be Smooth

First of all, gravy should be smooth and free from lumps. When it is made by browning flour in the pan before adding liquid, the secret lies in add-

ing the liquid slowly enough so that the lumps of fat and cooked flour may be absorbed by the water or milk as it is added. Gravy made by stirring the flour thickening into the hot broth must be stirred until it boils to prevent the formation of lumps. Of course, gravy may always be strained, but this should not be necessary, and will not be if it is carefully made.

A big help in preparing a smooth flour thickening to start with is a small Dover beater that may be turned in the cup or bowl used for the flour. The flat-bladed turbine beater will accomplish the same results, and either of the beaters will save three-fourths of the time necessary to stir the mixture smooth with a spoon or fork. Straining the thickening as it is poured into the hot broth will insure a perfectly smooth gravy without spending too much time on the thickening. The thickening mixture should also be thinned out fairly well before stirring into the boiling broth, as too thick a mixture is sure to produce lumps in the gravy.

May Save Time

When it is the custom to use gravy made with browned flour, the housewife may save some time by browning several cupfuls at once. This preparation will, of course, have to be watched carefully to see that it is keeping perfectly, but in cool weather it may easily be kept for some time.

Ye Editor's rule for deciding on the type of gravy is governed by the color and richness of the broth. Where the broth or meat fryings are pale in color, she browns flour in fat for the gravy. When the drippings are well-browned and richly flavored, she dissolves them in hot water and prepares the gravy with a smooth flour thickening. In the case of chicken broth, if a yellow gravy is desired, the yolk of an egg mixed well with the flour thickening will turn the trick. If milk is to be used in place of water for the liquid, the flour can be browned to a darker color, as milk otherwise makes a whiter gravy.

The thickness of the gravy is important, though somewhat subject to the preferences of the family. Ideal gravy is not thin and watery; neither is it stiff and heavy. It flows smoothly, yet it is not too thin. Perfection lies somewhere in between.

Seasonings Important

Then come seasonings. The real purpose of gravy is to improve the flavor of other foods, both meat and vegetable, and if its own flavor is flat, it will detract from the general "tastiness" of the meal. Again the term "well-seasoned" is often misinterpreted, and a too highly seasoned dish is the result, one in which all the individual flavor has been destroyed by too much pepper or salt. The home cook may vary the usual salt and pepper with a little paprika, a grain or two of cayenne, a very little mustard, sage, onion, celery salt or thyme. All seasonings should be added in minute quantities, so as to secure a teasing, elusive flavor, that defies detection as to its exact source.

More than likely, those who enjoy what has been prepared will not even recognize the different flavor. They really should not, but will eat the meal with greater zest, and will give to the cook the tribute of asking for "seconds," a compliment whose sincerity cannot be doubted.

Recipes for Apple Desserts

WHO IS there among us that does not like apples? We like them just as they come from the box, polished red skins and all; we like them as plain, old-fashioned apple sauce; and we like them in pies, puddings and cakes. Because of their delicate, yet satisfying flavor, they lend themselves admirably to almost every type of cookery. Their excellent keeping qualities and moderate price make them an economical fruit for every home. Their mineral content and body regulating properties make them valuable from the health standpoint. We like 'em and they're good for us! Long live King Apple!

Apple Dumplings

Wash, peel and slice or chop well-flavored, slightly tart apples. Prepare a shortened, slightly sweetened biscuit dough. For each individual dumpling, roll out a circle of dough about one-fourth inch thick and five inches in diameter. Fill with the chopped apples, allowing just room enough to bring the edges together. Season the fruit with bits of butter, sugar to taste, and a dash of nutmeg. If the apples are not tart, a few drops of lemon juice will improve the flavor. Pinch the edges of the dough together and arrange the dumplings in a greased bread pan. Pour over sufficient hot water to just reach the top of the dumplings, but do not cover them. Sugar may be dissolved in the water to make a light syrup if desired. Bake in a hot oven for the first 15 minutes, then cool somewhat and cook slowly till apples are soft. Serve warm or cold with the syrup from the pan and rich cream.

Glazed Apples

Select firm, unblemished, red skinned, slightly tart apples, allowing one for each person. Remove the cores carefully. Prepare a heavy syrup of sugar and water, add sufficient red cinnamon candies for color and flavor and pour over apples. Bake slowly in slow oven till apples are tender but still retain their shape. Remove apples to individual dishes and pour remaining syrup over them. Serve with thick cream or whipped cream. It may be necessary to turn the apples in the syrup while baking when they are about half done.

Scalloped Apples

4 good cooking apples	1 c. soft bread crumbs
¾ c. sugar	2 T. lemon juice
Nutmeg and cinnamon	½ c. butter
	4 T. water

Melt butter and add the crumbs. Butter a baking dish. Cover bottom of dish with crumbs. Have apples washed, pared and sliced in thin slices. Arrange on the crumbs. Sprinkle the apples with the sugar, spices, lemon juice and water. Cover with remainder of crumbs, and bake until the apple is done, which should be about one-half hour. Apple sauce may be used in place of raw apple, in which case a shorter time for baking would be sufficient. Serve slightly warm with cream.

Apple Fritters

1½ c. flour	⅔ c. milk
2 t. baking powder	1 egg
¼ t. salt	2 tart apples

Mix and sift dry ingredients, add milk gradually and egg well beaten. Pare, core and cut apples in eighths, then cut eighths in slices, and stir into batter. Drop by spoonfuls into deep fat and fry until brown. To test fat for correct temperature, drop in an inch cube of bread from the soft part of the loaf, and if in one minute it is a golden brown, the fat is then of right temperature for frying any uncooked mixture, such as fritters. Drain on brown paper, and sprinkle with powdered sugar. Serve hot on folded napkin.

Apple Tapioca

6 T. tapioca	½ t. salt
¾ c. cold water	1 t. lemon juice
2 c. boiling water	¾ c. sugar
3 tart apples	

Wash and pare apples and cut in eighths. Soak tapioca in cold water one-half hour. Place all ingredients in double boiler and cook one hour. When cold serve with sugar and cream.

Apples With Bananas

6 large sized apples	1 T. butter
1 c. corn syrup	1½ bananas
6 marshmallows	

Wipe, pare and core the apples. Place in a pan and add the syrup and butter. Simmer slowly, turning the apples frequently until they are tender yet hold their shape. Remove to a casserole and insert one-quarter of a banana in each apple. Place a marshmallow on top of each apple. Pour the syrup around them and bake at 400 degrees Fahrenheit (hot oven) until the marshmallows are puffy and brown. Serve at once.

Apple Sauce Cake

1 c. sugar	½ t. cloves
½ c. shortening	2 c. pastry flour
1½ c. apple sauce	½ c. raisins
2 t. soda	½ c. chopped walnuts
1¼ t. salt	¼ c. butter
1 t. cinnamon	1 c. powdered sugar
½ t. nutmeg	1 T. milk
	1 t. vanilla

Cream the shortening and sugar together, add the unsweetened apple sauce into which the soda has been beaten. Then add the flour sifted with the salt and spices, reserving a little to dust over the raisins and nuts, which should be added last. Beat well together and turn into a well-greased and floured cake pan. Bake in 375 degrees Fahrenheit (quite hot) oven for about 40 minutes. Ice, when cold, with a butter frosting made by blending the remaining ingredients.

Table of Abbreviations

1 t. equals 1 teaspoonful.
1 T. equals 1 tablespoonful.
1 c. equals 1 cupful.

All measures are level.

Cletrac "20-K" Shows

"what a man can really expect from a Tractor"

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(Signed) J. W. KRAMAR.

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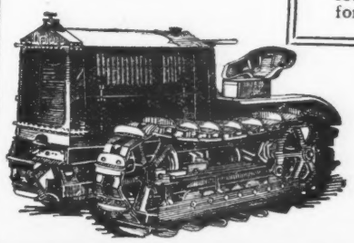

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kill Aphis
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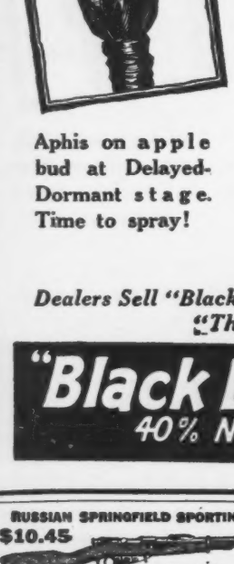

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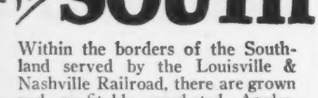

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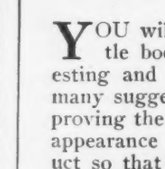

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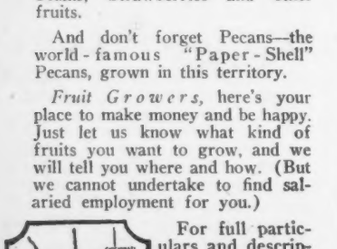

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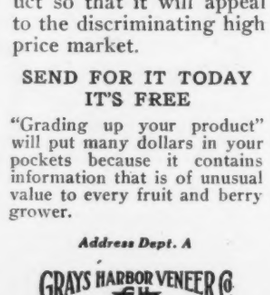

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Dilute Versus Standard Sprays for Apple Blotch

(*Continued from page* 18)

weeks' applications gave so nearly perfect control of blotch that a six-weeks' spray could not well improve the score.

No. 1. It will be seen in group 1, embracing the Bordeaux formulas, that lime-sulphur solution, in each plot, was used for the "open calyx" or petal-fall spray. This was done in compliance with the formerly, and yet generally, prevailing belief that the petal-fall application is the one most likely to cause russeting of the tiny, newly formed apples, and that it is safer to use lime-sulphur for this particular spraying. However, we have found that a great deal of the russeting of apples by spraying is the result of the pre-bloom or "pink" application. We regret that there is not space to discuss this subject at greater length.

Of still greater interest and importance in group one of the tabular record presented are the figures showing that there is less than one per cent of difference in the average percentage of blotch-free fruit from use of the Bordeaux formulas 3-9-50, 2-6-50 and 1-3-50; and, again, only 1.3 per cent difference between the five-year average results from the 3-9-50 and ¾-2¼-50 formulas. But these figures alone by no means tell the whole story; for the 3-9-50 or "standard" Bordeaux severely injured the foliage many times during the five-year period of the test, causing much yellowing and dropping of leaves. The apples, too, were considerably russeted each year or the skins so roughened that the color and finish were seriously affected. In sharp contrast, where the more dilute formulas were used, the injury to foliage and fruit was proportionately less. There was very little evidence of such injury where the 1-3-50 and ¾-2¼-50 formulas were used. And here is substantial foundation for our claim that a mild or dilute spray *thoroughly* (not wastefully) applied will produce results superior to those secured by application of strong, dangerous and more expensive solutions in the far too generally prevailing careless, indifferent, "hit-and-run" fashion.

No. 2. In group two of the tabular record may be seen the surprisingly high percentages of wholly blotch-free apples produced in the plots sprayed with commercial lime-sulphur at the usual rate of dilution (1¼-50) and also at the *unusual* rate of ¾-50 for the one year, 1926. The difference in control of blotch by use of these lime-sulphur sprays as compared with standard and dilute Bordeaux mixtures is so slight as to be of little or no consequence—as the five-year percentages of blotch-free fruit in the two groups stand in evidence. But here, again, figures alone fall short of portraying the really outstanding results in this comparison There was but very little spray injury to foliage and fruit by the lime-sulphur sprays during the five-year period of the test, while the color and finish of the fruit were far superior to those of the apples from the plots sprayed with Bordeaux.

No. 3. Without leaving a representative plot of trees as a "check" or "yard-stick" for measuring the results of sprayed plots, an experiment of this kind would prove nothing at all. This plot of trees received no fungicidal spray during the five-year period, and there resulted an average of less than 13 apples out of every 100 that were clear of blotch.

No. 4. In this group may be seen the evidence that dry lime-sulphur (powder form dissolved into solution) used as a spray gave equally as fine control of blotch as did the commercial liquid form. We find that the dry lime-sulphur is even less likely to injure foliage and fruit than is the commercial solution.

No. 5. This group presents results from use of a comparatively new spraying material—colloidal sulphur. At the beginning of the three-year period in which this was used, the results were far from satisfactory. However, there seems to be considerable improvement in this new sulphur product—especially in the stock that was sent to us for trial in 1926. It comes to the orchardist either in paste or semi-liquid form. The latter is preferable, as the paste is usually very slow to reduce to a solution.

No. 6. We have used "Sulphocide"—a very concentrated liquid solution as it comes from the factory—for two seasons in spraying for blotch. Although it has been very carefully used according to explicit instructions from the manufacturer, we have had slight burning of foliage from this spray, and, as well, considerable burning or blackening of the calyx lobes of the apples. The finish of the fruit so far as high color and extreme glossiness are concerned was extra fine.

Nos. 7 and 8. Here are presented results from the use of high grade hydrated lime sprays without, as well as with, addition of Kayso. The proportion of lime to 50 gallons of water, it will be noted, is the same as used in our standard Bordeaux formula. Perhaps we might with some justification designate this spray a "copperless Bordeaux." The percentages of blotch-free apples from the plots treated with sprays of hydrated lime, we believe the reader will agree, are rather surprising.

At the very outset of this series of spraying experiments (1922) in which our Bordeaux formulas were characterized by unusually heavy proportions of lime, we began to suspect that the lime itself was exerting some hitherto uncredited fungicidal influence. So decidedly impressed were we with the behavior of the unusually weak Bordeaux sprays containing 75 per cent of lime to 25 per cent of copper sulphate, that we decided to find room for plots to be sprayed with lime solutions. These plots constantly and consistently have been demonstrating that lime has been exerting a very helpful influence in prevention of fungous diseases of foliage and fruits when used as a component part of Bordeaux. Yet not until up to the present time, in nearly 40 years' use of Bordeaux in this country, has any credit whatever been accorded the lime as a fungicidal agency. The credit for disease control has been exclusively attributed to the copper, and the lime has been regarded solely as a medium through which the caustic properties of copper sulphate were rendered comparatively harmless.

We are not at this time recommending that anyone adopt lime alone as a fungicidal spray; but we are safe in predicting that lime in the future will come to be more and more largely used and appreciated—not merely as a substance to render strong and dangerous sprays "safe for democracy," but for its own well-marked fungicidal properties and its safety when used alone or in generous combination with other materials. The brightest, cleanest and most luxuriant apple foliage in our test orchards, in the fall of 1926, was upon the trees of the plots receiving the lime sprays.

Winter Precautions Against Pear Blight

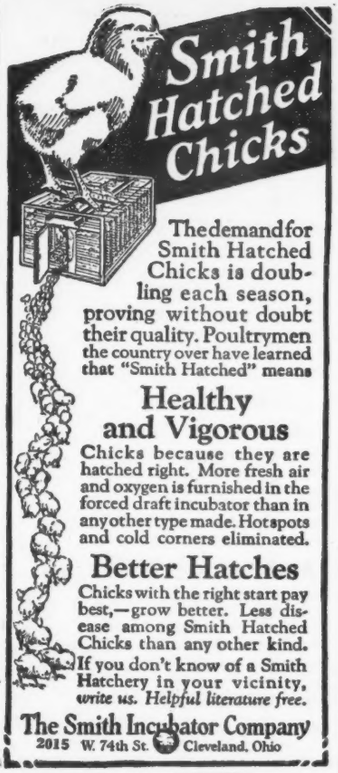
(*Continued from page* 9)

not the blight has already done so much damage as to make it unprofitable to spend the time scarifying the canker. It is almost impossible to give a rule regarding the thickness of inner bark tissues that must be left in order to prevent injuring the cambium with the disinfectant. This can best be learned by experience, but we might suggest, as an off-hand rule for the beginner, that if the bark is shaved inwardly not much closer to the wood than the thickness of two or three postal cards combined, there is apt to be damage done to the cambium by the disinfectant. If cankers can be found in the spring and summer before they are more than one or two weeks old, as a usual thing the disease will not have penetrated too deep for one to save the cambium. If the canker is older and has run a long way up and down the branch or trunk, and the outside bark is shriveled and blackened, it is hardly possible to save the cambium; and since there are likely to be deep stringers of the disease, it would require much more practice to scarify properly. In such cases, amputation of the branch is necessary. During the spring and summer, while the disease is quite active, it is necessary to scarify from six to 10 inches below and above the last indications of the disease in the bark; but during the winter if the canker is practically dormant, it is unnecessary to scarify more than four to six inches beyond these internal evidences.

"ROSES and Their Culture" is the title of a new book written by S. C. Hubbard of the Department of Floriculture, Massachusetts Agricultural College.

The author has made a specialty of roses for years, having been in charge of one of the rose testing gardens of the American Rose Society. Thus he writes from experience as well as from classroom and book study of the subject.

The book presents in a clear and concise manner the requirements of successful rose culture. It is divided into 10 chapters, each of which treats an important phase of the subject. Anyone interested in roses either from an amateur or from a professional standpoint will find the book interesting and valuable. The book is sold by the Orange Judd Publishing Company of New York for $1.25.



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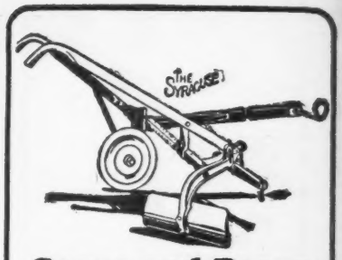

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FRUIT GROWERS IN THE OZARKS OF southern Missouri and northern Arkansas have a big advantage in having soil ideally adapted to fruit and berry growing. A mild healthful climate, pure mountain spring water, hard surfaced roads, good schools and prosperous growing communities make the Ozark region a fine place to live. The nearby cities of St. Louis, Kansas City and Memphis provide great markets. Land can still be bought or rented at prices that insure good profits on grapes, strawberries, apples, small fruits and vegetables. Write Frisco Railway, 888 Frisco Bldg., St. Louis, Missouri.

CALIFORNIA POULTRY AND FRUIT RAISING —If you are interested now, or at some time in the future, in owning a profitable poultry farm, or fruit and poultry farm combined, in southern California, send for a copy of our booklet, "How to Go in the Chicken Business and How to Stay In." California Hotel Farm Company, 18 North Euclid Ave., Pasadena, California.

WONDERFUL BUY IN FRUIT AND BERRY farm on State Highway No. 7 near Moline. Best located and best advertised roadside market in the state. 47 acres the best varieties, four year old, scientifically handled apple orchard. Also 10,000 Latham red raspberry plants. Write for details. Kerns & Vernon, Moline, Ill.

SACRIFICE SALE—40-ACRE ORCHARD NEAR Baltimore. On railroad. Excellent condition. 1926 crop, 35 carloads. Write for details. Westminster Realty & Insurance Co., Westminster, Maryland.

FARM WANTED

WANTED—TO HEAR FROM OWNER OF LAND for sale. O. Hawley, Baldwin, Wis.

ORCHARD WANTED

WANTED—COMMERCIAL APPLE ORCHARD— To buy or lease with option to buy. Carroll Dutton, Galesville, Wis.

NURSERY

MASTODON EVERBEARING STRAWBERRIES, 18 one quart. World's largest. Plants less than 2c each. Why pay more. Three crops. Bears first year planted, July until winter. Champion everbearing. $2,059.20 one acre. United States record. Nine yearly average $1,554.45. Direct from originator, 250 plants, $3.50 postpaid. Illustrated catalogue free. Edw. Lubke, New Buffalo, Mich.

STRAWBERRY PLANTS: EXCELSIOR, IMP. Klondike, Missionary, Dunlap; 500, $2.00; 1000, $3.25; 5000, $15.00; 10,000, $27.50; express collect. We also have onion plants, cabbage plants, rhubarb roots, sweet potato plants, asparagus roots. Price list in colors free. J. A. Bauer (47th year in business), Lock Box 38, Judsonia, Ark.

MASTODON, THE LARGEST EVERBEARING strawberry, sweet, enormous cropper from July to November, 18 fill quart box. Alfred, the 1½-inch blackberry. Hardy, sweet, upright grower. Concord grape, 1 year plants, cheap. Strawberry plants, $3.50 per thousand and up. Catalog free. Special prices on large lots. South Michigan Nursery, Box 1, New Buffalo, Michigan.

PEACH TREES $5.00 PER 100 AND UP, APPLE trees $7.50 per 100 and up. In large or small lots direct to planters by freight, parcel post, express. Plums, pears, cherries, grapes, nuts, berries, pecans, vines. Ornamental trees, vines and shrubs. FREE catalog in colors. Tennessee Nursery Co., Box 101, Cleveland, Tenn.

APPLE AND PEACH BUDDED FROM BEARing orchards and sold direct to planters. Save money and disappointment. Catalogue Free. Waynesboro Nurseries, Waynesboro, Va.

HIGH-GRADE BAGBY GROWN FRUIT TREES and plants. Absolute satisfaction guaranteed. Write for price list. Dept. F, New Haven Nurseries, New Haven, Missouri.

APPLE AND PEAR SEEDLINGS, GRAFTING wax, waxed thread, grafting knives and raffia. Whole and piece root grafts. Price list. Whitford Nursery, Farina, Ill.

STRAWBERRY PLANTS. MASTODON EVERbearing and standard varieties. Prices low. Catalogue. Pirtle Bros. Nursery, Bloomfield, Ia.

500 MASTODON EVERBEARING STRAWBERRY plants free. Free catalog explains how. South Michigan Nursery, Box 1, New Buffalo, Michigan.

CUMBERLAND RASPBERRY PLANTS (TWICE inspected), $1.50 per hundred; $12.00 per thousand. S. H. Graybill, Richfield, Pa.

CUMBERLAND BLACK RASPBERRY PLANTS for sale. J. A. Combs, Rural Route 2, Collinsville, Ill.

PEACH TREES FOR SALE—FINE STOCK. Attractive prices. E. Brakefield, Shiloh, Ga.

STRAWBERRY PLANTS. CATALOG FREE. Jeff Beaver & Sons, Eau Claire, Wis.

LATHAM RASPBERRY PLANTS, MOSAIC free; strawberry plants. A. B. Coleman & Son, Aitkin, Minn.

ORCHARD SUPPLIES

SEND FOR COMPLETE PRICE LIST. S. H. Burton, Washington, Indiana.

HELP WANTED

YOU ARE WANTED. MEN-WOMEN, 18 UP. U. S. Government life jobs. $95.00 to $250.00 month. Steady work. Short hours. Paid vacation. Experience unnecessary. Common education sufficient. Sample coaching with full particulars—free. Write today sure. Franklin Institute, Dept. G-81, Rochester, N. Y.

HELP WANTED—FEMALE

YOU ARE WANTED. GIRLS-WOMEN, 16 UP. Learn gown making. $35.00 week. Learn while earning. Sample lessons free. Write immediately. Franklin Institute, Dept. G-545, Rochester, New York.

POSITION WANTED

POSITION AS WORKING ORCHARD MANager by successful orchardist. Willing to consider a deal on salary and profit-sharing basis. Address Box 21, American Fruit Grower Magazine, 53 W. Jackson Blvd., Chicago.

COMMERCIAL ORCHARD POSITION WANTED before April 1 by an experienced, college trained, single man on salary basis. John S. Fyock, Norristown, Penna.

YOUNG MAN EXPERIENCED IN ORCHARD work would like position. Address Box 22, American Fruit Grower Magazine.

FOR SALE

FOR SALE—No. 4 CUTAWAY CALIFORNIA orchard plow. New. Purvis Briner, Hazleton, Ind.

BEES

BOOKING ORDERS FOR POUND PACKAGES OF bees and queens for spring delivery. It will pay you to get our prices.—Overbey Apiaries, Leonville, La.

CHICKS

BUY ATHENEON PURE BRED CHICKS AND get the benefit of our seven years' breeding and hatching experience at no extra cost. Thousands of satisfied customers. Write for our beautiful color catalog. Free. Athen Chick Hatchery, Box 17, Athens, Ohio.

CHICKS; ATTRACTIVE TERMS. LEADING breeds. Reduced prices. Rich Hill Hatchery, Dept. 602, Rich Hill, Mo.

MOTORCYCLES

FINE USED MOTORCYCLES, ALL MAKES; guaranteed, shipped on approval; terms; bargain prices. Write for free catalog U. Clymer, Denver, Colo.

RABBITS

MAKE BIG PROFITS WITH CHINCHILLA rabbits. Real money makers. Write for facts. Conrad's, 846 California Bldg., Denver, Colo.

TOBACCO

HOMESPUN TOBACCO—SMOKING OR CHEWing, 4 lbs., $1.00; 12, $2.25. Send no money. Pay postmaster on arrival. Pipe free for ten names of tobacco users. United Farmers of Ky., Paducah, Ky.

AGED LEAF TOBACCO. SELECT CHEWING— 3 pounds, $1; 10, $3. Best smoking—10, $2.50; good, 10, $2; scraps, 10, $1. Prompt shipment. Money back if not pleased. Co-Operators, Murray, Ky.

LOOK! FIVE POUNDS GOOD MELLOW SMOKing tobacco, $1.00. Five pounds chewing, $1.25. Quality and satisfaction guaranteed. Farmers' Club, 55, Hazel, Kentucky.

SUN-CURED SMOKING TOBACCO, MILD, FRAgrant aroma, three years old. Ten pounds, two dollars. Sample free. Louis Igleheart, Owensboro, Kentucky.

TOBACCO: KENTUCKY SWEET LEAF, MELlow with age. Fine flavor. Smoking, 15 lbs., $1.50; chewing, $2.25. Pay when received. Ernest Choate, Wingo, Kentucky.

WATCHES

SAVE 20% ON AMERICAN WATCHES; ELgins, Walthams, etc. Price list free. George Thurlow, Federal street, Newburyport, Mass.

MISCELLANEOUS

OLD MONEY WANTED—DO YOU KNOW THAT coin collectors pay up to $100.00 for certain U. S. cents? And high premiums for all rare coins? We buy all kinds. Send 4c for large coin folder. May mean much profit to you. Numismatic Co., Dept. 546, Ft. Worth, Tex.

YOUR NAME AND ADDRESS STAMPED ON neat metal tag for your keys, trunks, auto license, etc., 25c. Any emblem. Acme Metal Tag Co., Box 614, Murphysboro, Ill.

EARN $25 WEEKLY, SPARE TIME, WRITING for newspapers, magazines. Experience unnecessary. Details free. Press Syndicate, 979, St. Louis, Mo.

TYPEWRITERS, $10 UP. EASY PAYMENTS. Yotz Typewriter Co., Shawnee, Kansas.

Control Measures for Cherry Maggots

METHODS for combating the cherry maggot are outlined in a publication now available at the New York State Experiment Station at Geneva. This troublesome pest, which often causes much loss and annoyance from "wormy" cherries, may be easily controlled by the timely application of a poison spray, say the station entomologists. The first application of the spray is due at about the time that Early Richmond cherries show red on one side, and should be followed with a second application when the Montmorency cherry shows red, say the specialists.

The spray mixture recommended is made up of lime-sulphur, two and one-half gallons; arsenate of lead, two and one-half pounds; and water to make 100 gallons. For sweet cherries the lime-sulphur is reduced to two gallons. Applications of a sulphur-lead arsenate dust (90-10) also gave a fair degree of control where care was taken to keep the foliage and fruit well covered by repeated dusting after heavy rains.

Supplementary measures include the use of quick-acting contact insecticides, such as nicotine sulphate; early picking of the entire crop as soon as it is ready for market; orchard cultivation to destroy the pupa or resting stage of the maggot; and the removal of crop remnants, such as culls, odd varieties, etc. Ordinarily, however, it is believed that the main reliance of the cherry grower should be placed on the use of arsenical sprays.

A copy of the station circular describing methods of cherry maggot control may be had free of charge by addressing a request to the Agricultural Experiment Station, Geneva, N. Y.

Plastering Pear Psylla

A METHOD for combating pear psylla whereby the young insects are encased in plaster of Paris and suffocated has been perfected by F. G. Mundinger, entomologist for the Hudson River Valley Fruit Investigations of the state experiment station, according to a recent announcement by station officials. The plaster of Paris dust, which is a combination of four parts of fresh hydrated lime to one part of high grade plaster of Paris, hardens quickly when it comes in contact with the moist bodies of the young psylla, it is said.

Repeated tests with this dust mixture have demonstrated its effectiveness in the Hudson River Valley and have proved that it is harmless to foliage and fruit, says Mr. Mundinger. Also, the cost is nominal, amounting to about three cents a pound, which is sufficient to cover an average sized tree.

After the insect has passed the early stages of development and has become what is commonly known as a "hard-shell" or has transformed into an adult, it will be necessary to add nicotine to the dust for effective control. One pint of nicotine sulphate to each 50 pounds of dust is said to give good results. Also, sulphur at the rate of 10 pounds or two pounds of copper dust may replace similar amounts of lime in each 50 pounds of the mixture for protection against diseases. If chewing insects are present, five pounds of lead arsenate are added for an equal amount of lime.

The addition of nicotine, lead arsenate, cyanide, sulphur, copper, etc., will increase the cost of treatment somewhat for the later stages of the pest. For the early stages, however, these materials are not needed for very effective control.

Berry Boxes and Crates
Either made up or in the K. D., American quart Berry Baskets, Climax Grape and Peach Baskets, Till or Repacking Baskets, Plant Boxes and Veneer Tree Protectors. Circular and Price List mailed upon request. Write for special prices on carload lots. Liberal discounts on early orders.
Sheboygan Fruit Box Company
Sheboygan, Wis.

Roup Kills Millions

Of Chickens Every Year—Easy to Prevent by a Simple Method

No longer is it necessary to see your chickens devitalized and killed by that most loathsome disease—Roup.

It's so simple—just keep Conkey's Roup Remedy in the drinking water all the time.

It comes in the form of a powder; easily dissolves in water. Chickens doctor themselves as they drink.

It kills roup germs, stops the disease and keeps the water sterile, thus preventing spread of colds and disease through the contamination of water by affected fowls.

Isaac Roberts, Helena, Montana, writes: "Have found your Roup Remedy fine for checking spreading of colds and canker—much better than permanganate of potash."

Prices on Conkey's Roup Remedy anywhere—Packages, 30c, 60c, $1.20; 1½ lb. can, $2.50; 5 lb. can, $5.75; all postpaid.

Conkey's Canker Special stops and reduces that swelling of the membranes in the eyes and other places caused by colds or other roupy conditions. Prevents cankers from forming. Squirt it into eyes and nostrils.

Eastern Prices—Packages, 50c; pint, $1.20; quart, $2.00; gallon, $7.00; all postpaid.

Colorado and West—Packages, 60c; pint, $1.45; quart, $2.40; gallon, $8.00; all postpaid.

If your dealer cannot supply you with Conkey's, don't accept substitutes, as they may do actual harm. Send us your order, and we will ship it C. O. D. postage prepaid. You pay the postman for the **remedy only** when it arrives. [245]

Conkey's Poultry Book is worth a dollar to any poultry raiser. Sent for only 4 cents stamps to pay postage. Send for your copy today. The G. E. Conkey Co., 6659 Broadway, Cleveland, Ohio.

The Peerless Dust Gun is perfectly balanced—convenient to carry, a pleasure to operate, ball bearing, parts are interchangeable, gives satisfaction.

Just the thing for fruit growers.

Write for circular and name of dealer.

PEERLESS DUST GUN COMPANY
1600 E. 24th St.,
CLEVELAND, OHIO

LACK of power is the great thief of farm profits.

* * *

When you own a Case tractor you never have to skimp a job, miss a planting or harvesting date or lose a rotation.

* * *

With ample power for every job you can step your work up to the highest standards, and make more money every year.

* * *

Mail the coupon.

CASE

J. I. Case Threshing Machine Co.
Incorporated Established 1842
Dept. B-1 Racine Wisconsin

Please send me a copy of "Modern Tractor Farming".

Name.....

P. O......

State.....

A Perspective of the Oil Spray Situation

(*Continued from page* 39)

amount of nicotine sulphate, using it possibly as weak as a half pint of the tobacco extract to 100 gallons of the dilute emulsion containing two per cent oil. Of the two, the latter procedure is preferred for several reasons. So far, it may be stated, we have observed no significant injury from applications of the Bordeaux-oil spray (two per cent oil) to apple buds when the tips of the leaves of the more advanced buds were projecting no more than one-fourth to one-half inch.

It is one thing to have an efficient

The peach cottony scale. This insect is effectively combated by sprays directed against the hibernating scales. The crawlers and young scales are also susceptible to foliage applications of "white oil emulsions"

mixture, but it is an entirely different matter to put the material on the trees so that it will accomplish the purpose for which it is applied. There is entirely too great a tendency for growers to ascribe to spray mixtures properties that they do not possess. Efficient as are the oil sprays for certain species of insects, they neither possess miraculous properties nor are they fool-proof; and disappointing results will surely follow if they are not properly applied. As the insects are largely assembled on the buds, the object of spraying is to wet the buds, for in so doing there is little opportunity for the insects to escape treatment. To the reader this seems clear enough, but in actual practice probably more growers fail at this step than in any other essential procedure in fighting the rosy aphis. The chief defects of most spray operations are that too little spray mixture is used and not enough pains are exercised by the nozzle operator to insure thorough coating of all the buds. Low pressures, small nozzle output and short leads of hose are contributing factors. Probably no one factor counts so much as an active, intelligent nozzleman on the ground. As the period for effective spray is none too long, the grower planning to combat the rosy aphis should be prepared to act as soon as the aphids are out on the buds, for against the vagaries of the weather he has little protection or recourse.

Strong Oil Sprays for Leaf Roller Eggs

Of the pests that beset the apple industry, the control of the leaf roller is a conundrum to most growers. Large expense and small returns characterize many operations. As with the rosy aphis, the key to the solution of the problem is pretty much one of selecting an efficient oil spray and spraying thoroughly to coat all the egg clusters. In instances of heavy egg deposition, a few untreated egg clusters suffice to produce a surprisingly large crop of caterpillars. It should also be noted that tests of proprietary miscible oils have indicated considerable variation in the killing properties, some being more effective than others. At advertised strengths, a few of the preparations have not afforded efficient protection, indicating a need of more knowledge of their killing efficiency, as well as modification of the spray directions on advertising literature in the light of experimental results, to insure growers a larger degree of control on an average than has heretofore been obtained. Sprays of the type of lubricating oil emulsion, diluted with water to give an eight per cent oil content, appear as the most promising means of combating this pest; application being made in the spring as buds are swelling. The treatment is expensive because of the high oil content. The necessity of employing such strong mixtures adds to the danger of injury. This is the "nigger in the woodpile." Nevertheless, a single application in occasional years apparently produces no permanent ill effects on the health of the trees. In lieu of a better means of control, the oil treatment is probably warranted as an emergency measure where the crop at the time of picking shows from 15 to 20 per cent or more of the apples injured by the leaf roller.

Status of Oil Sprays for Foliage Treatments

Relative to future prospects of employing oils with safety when trees are in foliage, there is at the present time very little definite information on which to base an opinion. The type of oil, strength of spray as regards oil content, and weather conditions have apparently much to do with the character of the results. As a guiding principle, the grower had better go slow in applying the common types of oil sprays to trees in foliage. A beam of light in an otherwise dark corner is shed on this problem by the discovery of the so-called "white oil emulsion." Certain manufacturers of insecticides are now preparing "white oil emulsions" by their own special methods, which usually bear trade names and through extensive advertising are known to many growers, the brand "Volck" probably being given greatest publicity. While more expensive, these new spray oils differ from the common lubricating oil emulsion or miscible oils used in the past in that they are more safe to foliage. This discovery marks a new epoch with respect to oil sprays and gives promise of furnishing a new weapon for insect warfare which is likely to exert an important influence on future spray practices. In this state the "white oil emulsions" have already proved to be of great value for foliage treatments in combating red spider, peach cottony scale, and various scales on ornamental trees. From our experience, they seem to be of greater value in combating pests of this type than is the case with the codling moth.

In conclusion, it should be said that there is much to learn relative to the utility of oil sprays, especially with regard to foliage applications. While the future gives promise of important developments, nevertheless most growers would do well to play safe for the present, adhering as closely as their fancy and pocketbooks permit to standard spray practices and leaving to others the task of finding out the conditions governing the economical and safe employment of oil sprays for this general area.

Car Conductor—How old are you, little girl?

Little Girl—If the corporation doesn't object, I'd prefer to pay full fare and keep my own statistics.

"Now, Jack, I want you to understand that our engagement is at an end."

"Yes, Doris, I get you."

"On the contrary, you don't."

Old Pipe-Smoker Switches Back to Favorite Tobacco

Having tried other brands, he returns to his old favorite with new appreciation

Evidently, one way to appreciate a certain tobacco is to try another kind.

At least, that has been the experience of one veteran pipe-smoker. By switching temporarily to other tobacco he finally came back to his old-time favorite with a new appreciation and a vow never to change again.

It is significant that this pipe-smoker found that his former favorite tobacco still had the same flavor and quality that first won him to it. As a matter of fact, most pipe-lovers know that Edgeworth never changes.

Read Mr. Fishburn's "signed confession":

Peoria, Ill.
Aug. 26, 1926.

Messrs. Larus & Bro. Co.,
Richmond, Va.

Dear Sirs:

Just a confession and an appreciation.

A number of years ago I was a user of your Edgeworth smoking tobacco. But like some others, perhaps, I was led by alluring advertisements to change.

A few days ago I went into a drug store to get some tobacco, and on the case was the familiar can of Edgeworth. I bought it and since then I have enjoyed old-time comfort.

So my confession is that I made a mistake in changing to other brands, and my appreciation is such that Edgeworth will be my Smoke Pal while life lasts, which may not be long, for I have passed my "three score years and ten."

Very truly yours,
(Signed) E. P. Fishburn

To those who have never tried Edgeworth we make this offer:

Let us send you free samples of Edgeworth so that you may put it to the pipe test. If you like the samples, you'll like Edgeworth wherever and whenever you buy it, for it never changes in quality.

Write your name and address to Larus & Brother Company, 13-N S. 21st Street, Richmond, Va.

We'll be grateful for the name and address of your tobacco dealer, too, if you care to add them.

Edgeworth is sold in various sizes to suit the needs and means of all purchasers. Both Edgeworth Plug Slice and Edgeworth Ready-Rubbed are in small, pocket-size packages, in handsome humidors holding a pound, and also in several handy in-between sizes.

To Retail Tobacco Merchants: If your jobber cannot supply you with Edgeworth, Larus & Brother Company will gladly send you prepaid by parcel post a one- or two-dozen carton of any size of Edgeworth Plug Slice or Edgeworth Ready-Rubbed for the same price you would pay the jobber.

On your radio—tune in on WRVA, Richmond, Va.—the Edgeworth station. Wave length 256 meters.

Profitable Poultry

By Ralston R. Hannas

Care of Early Hatched Chicks

THERE has been a great deal said about hatching chicks early; the advantages have been pointed out; and the way it fits into the scheme of raising the chickens the rest of the year has been discussed. Let us suppose you have hatched or will hatch some early chicks. What is the best way of taking care of them? Do they require any different care than chicks hatched at any other time of the season?

In the first place, accommodations should be ready for them. The chances are that a broody hen will not be available, so a brooder will have to be provided for the new chicks. It makes no difference what kind of a brooder is used; a coal stove or an oil brooder will do. If an oil brooder is used, some additional heat may be necessary in extremely cold weather. The brooder should be started a few days before the chicks are ready to be put under it in order that one may see if it is in good working condition and is able to supply the necessary heat to keep the chicks warm. A good brooder should be able to maintain a temperature of at least 100 degrees, and this temperature should be had when the babies are first put under it.

The same kind of care and attention should be given now as is given at a later season. However, the amount of sunlight the chicks can have to run in is generally smaller at this season than later. Something must therefore be done to make up for this deficiency if strong healthy chicks are to be brooded. Cod liver oil, about which there has been so much in the papers within the last year, is a mighty good substitute for sunshine. It contains two of those mysterious things known as vitamins, which are so essential for life. One is known as vitamin A. The other, the particular vitamin in which we are interested here, is known as vitamin D and is very necessary in the formation of bone. This vitamin is known as the "anti-rachitic" vitamin, and serves to prevent leg weakness.

There is no trick in feeding cod liver oil. It is simply given in the mash at the rate of two per cent of the amount of mash fed, or two per cent of the amount of grain fed, that is, two per cent by weight. Chicks should also be given all the milk and green food that is available. They should have the milk right from the start, at least through the first six weeks of their life—preferably right on through the growing period. It may be necessary to sprout some oats for them, if cabbage or something else green cannot be obtained. Otherwise, the same feed and care are given for these early chicks as for later ones.

Comfortable Houses

FEBRUARY is a short, snappy month and can provide a variety of rough weather for the chickens. In order to maintain the health of the birds and to get the maximum egg production, it is necessary to make the houses as comfortable as possible. Dry litter and ventilation are two very important items to consider just now to this end. As soon as the litter becomes damp after a storm, remove it and replace it with fresh, dry litter—straw is the best litter for chickens.

A circulation of air in the house will help to keep the litter dry and prevent moisture from condensing on the walls and under side of the roof. Direct drafts on the chickens, however, are not wanted. One way of obtaining this ventilation is by having a certain amount of open space in the front of the house that is open all the time, except in stormy or real cold weather. At such times, the opening is closed by means of a muslin curtain tacked to a frame that is made to fit this opening. The amount of open space generally consists of one square foot to every 10 square feet of floor space, roughly. For example, in a house that is 10 feet by 12 feet, there are 120 square feet of floor space, which would mean that the open space in the front of the house would contain 12 square feet of space. This area is equivalent to an opening three feet wide and four feet long. This opening should be located as high in the front as possible, just so the sun will not be shut out by the overhanging roof, if the roof does overhang.

In addition to this open front, a box ventilator may be built either along the side wall, about midway of the building, or in the center of the house; it should extend from about a foot and a half off the floor up through the roof for about two feet. This ventilator should have a covering to prevent rain and snow from beating in; this covering can be a flat one, as, for instance, a square, with the four sides of the ventilator open just underneath this flat top for a space of about six inches. By means of a slide at the bottom of the ventilator inside the house, the amount of ventilation can be regulated.

The birds can be protected from drafts while they are on the roosts by having a double wall in the rear extending from the bottom of the roosts up along the rear wall and just under the roof up towards the front of the house to a distance just above the front edge of the dropping board. As two by four-inch material is generally used for the studding and rafters, the boards can be nailed to these, thereby forming a four-inch air space between the inner wall and roof, and allowing for a circulation of air. A comfortable house is wanted, but not a hot one, for that will weaken the vitality of the chickens.

Frozen Combs

THIS is the kind of weather in which combs are likely to be nipped. If any are nipped, they can oftentimes be treated, provided they are treated a short time after they have been frosted. A good mixture to rub them with is one composed of five tablespoonfuls of vaseline, two of glycerine and one of turpentine. Rub this well into the comb and wattles.

Hay for Hens

HAY CAN be made to take the place of greens for chickens during the winter time. For this purpose, second cutting alfalfa that has not been rained on during the harvesting period and properly cured soybeans and clover will serve very well. The problem of getting sufficient green food for the chickens during winter is a difficult one unless some crop has been grown especially for this purpose, such as cabbage, or a succulent crop like beets, or unless some green food is grown during the winter, such as sprouted oats. The use of hay, such as mentioned above, will help solve the problem to a very large extent.

Iodine for Poultry

THE USE of iodine with poultry is a comparatively new practice. Iodine does not have a general use now, but is used in some mineral mixtures and in the mash by some poultrymen. The men who use it feed from three to five drops per bird per day and report good results.

Iodine in the form of iodides has been incorporated in mineral mixtures, and it seems to have given good results by aiding in the assimilation of certain elements that are needed by animals. An English medical officer says: "Iodine is necessary for effective metabolism, and especially promotes respiratory exchanges and physical growth. It is required for the digestion, assimilation, and combustion of fats. When a shortage occurs, the fat cannot be satisfactorily dealt with, and is stored in the subcutaneous tissues. It is required for the metabolism of calcium."

Potassium iodide was fed to young growing swine at the state college of agriculture in Iowa with the result that the swine increased their average daily gain by 10 per cent, and at the same time the amount of food required was decreased 10 per cent.

Only recently, Dr. Chandler of the Michigan State Agricultural College, has brought out an iodine vermicide and iodine suspensoid in such form as to hold the "free iodine" until applied. This free iodine will kill worms and remove them from the birds and will kill worm eggs and larvae. The vermicide is injected into the bird's gizzard through the mouth by means of a one-ounce syringe to which is attached a hard catheter, or tube, about 12 inches long. The suspensoid is applied to the floor, dropping boards and soil to kill the eggs and larvae. Iodine is the only chemical which in practical amounts will destroy worm eggs and larvae, according to Dr. Chandler. It will also kill coccidia, and is therefore an aid in fighting coccidiosis. The bird absorbs a certain amount of the iodine in the form of organic iodine compounds that are formed when the iodine combines with organic substances. This iodine has been shown by Dr. Chandler to be of value to the bird.

Spray Materials for Trees of Different Ages

MANY growers want to know about how much spray material will be needed for trees of various ages. Such information will enable them to know whether or not they are applying the proper amounts of materials to their orchards. The figures presented below were taken from Missouri Circular 99, written by H. A. Cardinell. These figures will enable any grower to ascertain whether or not he is using the proper amounts of material for his trees.

The vigor and rate of growth of trees make a very great difference in their susceptibility to injury. Trees making a weak growth are much more likely to be damaged than are vigorous individuals. The same spray which causes severe damage to a weak one may have very little injurious effect on a thrifty one. Cases are frequently observed in which a limb on an otherwise vigorously growing tree has been weakened by a brown rot or a frost canker. Such limbs may show severe arsenical injury and the remainder of the tree almost completely escape.

The reason for the increase in arsenical injury in recent years seems to be due to two factors: first, to the more general use of sprays on peaches, and second, to the use of spray materials in which the amount of lime as compared with sulphur has been reduced. The New Jersey and the Pennsylvania stations have found that sprays, self-boiled or the dry-mixed preparations, having a 16-16-100 (16 pounds of sulphur, 16 pounds of lime, 100 gallons of water) composition, to which arsenate of lead was added in the usual amount, gave little or no injury. On the other hand, arsenate of lead added to a spray of a 16-8-100 (16 pounds of sulphur, eight pounds of lime, 100 gallons of water) mixture caused considerable damage.

Measures for preventing arsenical injury may be summarized as follows:

1. Do not use an excessive amount of arsenate of lead in spray mixtures.

2. Make sure that all peach sprays in which arsenate of lead is used have as many pounds of lime as of sulphur in 100 gallons of spray. When using a so-called dry-mix of a 16-8-100 composition, if lead arsenate is present in the mixture, add eight pounds of lime to 100 gallons of spray before applying.

3. Give the orchard the best of care and thus keep the trees vigorous and resistant to injury.—*Michigan Agricultural Experiment Station Quarterly Bulletin.*

VOLUME OF SPRAY FOR TREES OF VARIOUS AGES

Age of Tree.	Peach Trees.	Plum Trees.	Pear Trees.	Apple Trees.
1 to 3 years	¾ to 1 gal.	¼ to 1 gal.	.....	.....
3 to 5 years	1 to 2 gal.	1 to 1½ gal.	¼ to 1 gal.	¼ to 2 gal.
5 to 6 years	2 to 2½ gal.	1 to 1½ gal.	1 to 1½ gal.	2 to 3 gal.
6 to 8 years	2½ to 4 gal.	2 to 3 gal.	2 to 3 gal.	2½ to 4 gal.
8 to 12 years	3½ to 5 gal.	2½ to 5 gal.	3 to 4 gal.	3 to 5 gal.
12 to 18 years	3½ to 5 gal.	4 to 5 gal.	4 to 6 gal.	4½ to 6½ gal.
18 to 25 years	3½ to 5 gal.	4 to 5 gal.	6 to 8 gal.	6½ to 10 gal.
More than 25 years	.....	.....	8 to 10 gal.	10 to 12 gal.

Liberal Irrigation Makes Less Water Core in Apples

WATER CORE, a serious disease of apples occurring in practically every important apple growing section of the world, may be reduced considerably by liberal irrigation and by picking the fruit at the proper maturity, according to Dr. Charles Brooks, pathologist of the United States Department of Agriculture. Six years of investigation have served to show that, contrary to the prevailing opinion, the disease occurs when the supply of water in the soil is inadequate rather than when it is excessive. The real cause of the trouble, however, is in connection with high temperatures, intense sunlight, and the accompanying high-sap concentration in the fruit.

The watery or glassy appearance of the flesh of the apple, a characteristic distinguishing water core from all other apple diseases, is due to the filling of the intercellular spaces with cell sap instead of air. When water is not available in sufficient quantity, high temperatures and intense sunlight cause the sap in the fruit to concentrate and exert enormous pressure on the cell tissues to a point where they break down. In irrigated regions experiments showed that apples from heavily irrigated trees developed less water core than those from lightly irrigated trees. Also less water core developed when light irrigation was followed by heavy irrigation than when the practice was reversed.

Picking at the proper stage of maturity is the most practicable preventive now known for the trouble, especially in the non-irrigated regions. The study showed that water core might increase as much as 90 per cent in 10 days after the proper time for picking.

How to Remove Bordeaux Mixture from Fruits

ACCORDING to Prof. M. G. Kains, Bordeaux mixture can be readily removed from fruits heavily spread with it by means of dilute acetic acid. A solution of one part of the acid in 20 parts of water will give satisfactory results. This is about the strength of ordinary vinegar.

The fruit should be placed in a wire basket, which is then dipped into a pail or tub partly filled with the solution. A few moments of movement up and down in the liquid will cause most of the Bordeaux to dissolve. Following this, the fruit should be immediately rinsed with a stream of clear water from a hose or faucet, after which the fruit should be dried. The solution may be used repeatedly until the acetic acid has become neutralized by the lime in the Bordeaux.